

# VPDES PERMIT PROGRAM FACT SHEET

This document gives pertinent information concerning the reissuance of the VPDES permit listed below. This permit is being processed as a Major Municipal permit. The effluent limitations contained in this permit will maintain the Water Quality Standards of 9 VAC 25-260-00 et seq. The discharge results from the operation of a sewage treatment plant serving the City of Winchester and parts of Frederick County. This proposed permit action consists of reissuing the permit with revisions to the permit requirements, as needed, due to changes in applicable laws, guidance, and available technical information.

SIC Code: 4952 (Sewerage Systems)

1. Facility Name and Mailing Address: Opequon Water Reclamation Facility  
P.O. Box 43  
Winchester, VA 22604

Location: 3100 Berryville Pike, Winchester, VA 22603

2. Permit No.: VA0065552 Existing Permit Expiration Date: February 11, 2006

3. Owner Contact: Name: Jesse W. Moffett  
Title: Executive Director  
Telephone Number: (540) 722-3579

4. Application Complete Date: November 14, 2005  
Permit Drafted By: Trevor H. Wallace Date: December 07, 2005  
DEQ – Valley Regional Office

Reviewed By: Bruce D. Lincow Date: 12/12/05  
Date: \_\_\_\_\_

Public Notice Comment Period: 6/5/2006 to 7/5/2006

5. Receiving Stream Name: Opequon Creek River Mile: 32.66  
Basin: Potomac Subbasin: Potomac Section: 11 Class: IV  
Special Standards: pH  
303(d) list? ☒ Yes ☐ No  
Tidal Waters? ☐ Yes ☒ No

See **APPENDIX B** for critical flow information.

6. Planning Information:  
☒ The discharge is in conformance with the existing planning documents for the area.  
☐ The discharge is not addressed in any planning document but will be included when the plan is updated.

7. Operator License Requirements: Class I

8. Reliability Class: II (assigned February 7, 1985)

9. Permit Characterization:

☐ Private ☐ Federal ☐ State ☒ POTW ☐ PVOTW  
☐ Possible Interstate Effect ☐ Interim Limits in Other Document

10. Description of Wastewaters and Treatment Facilities:

**APPENDIX A**

Total Number of Outfalls = 1

Operation and Maintenance (O&M) Manual: approved April 17, 2002

Sludge Handling/Disposal: Sludge is disposed in the Frederick County Regional Landfill.

11. Discharge Location and Receiving Waters Information:

**APPENDIX B**

USGS Topo Quad Name: Stephenson

USGS Topo Quad Number: 217A

12. Antidegradation Review & Comments: Tier: 1

The State Water Control Board's Water Quality Standards (WQS) includes an antidegradation policy (9 VAC 25-260-30). All state surface waters are provided one of three levels of antidegradation protection. For Tier 1 or existing use protection, existing uses of the water body and the water quality to protect these uses must be maintained. Tier 2 water bodies have water quality that is better than the water quality standards. Significant lowering of the water quality of Tier 2 waters is not allowed without an evaluation of the economic and social impacts. Tier 3 water bodies are exceptional waters and are so designated by regulatory amendment. The antidegradation policy prohibits new or expanded discharges into exceptional waters.

The antidegradation review begins with a Tier determination. The Opequon Water Reclamation Facility (OWRF) discharges to a segment of Opequon Creek, which is classified as Tier 1. This finding is based on the fact that the receiving stream is on the EPA 303(d) list with an approved TMDL for the General Standard (Benthic). Antidegradation baselines are not calculated for Tier 1 waters; however, permit limits for this reissuance were set such that Water Quality Standards will be maintained.

13. Site Inspection: Date: November 18 & 20, 2003

Performed by: Lisa M. Kelly

14. Effluent Screening and Effluent Limitations:

**APPENDIX C**

15. Toxics Management Program Requirements:

**APPENDIX D**

16. Permit Changes and Bases for Special Conditions:

**APPENDIX E**

17. Material Storage: This permit requires that the facility's O&M Manual include information to address the management of wastes, fluids, and pollutants which may be present at the facility, to avoid unauthorized discharge of such materials (9 VAC 25-31-280.B.2.).

18. Antibacksliding Review: Limits for ammonia-N and TRC are less stringent than the current annual limits. Also, limits for chloride were removed from the permit at this reissuance. See Appendix C for an evaluation which demonstrates why the relaxation and removal of these limits is acceptable. This permit complies with Antibacksliding provisions of the VPDES Permit Regulation, 9 VAC 25-31-220.L.

19. 303(d) List Considerations: The facility discharges to a stream segment listed in the currently approved 303(d) list. The stream is listed as impaired due to elevated bacteria levels and for not meeting the

## Fact Sheet – VPDES Permit No. VA0065552 – Opequon Water Reclamation Facility

General Standard (Benthics). The facility is allocated  $2.12 \times 10^{13}$  cfu/yr E. coli and 505.71 metric tons/yr TSS in the currently approved TMDL for Opequon Creek.

20. Regulation of Users per 9 VAC 25-31-280.B.9: N/A

21. Storm Water:

Application Required per 9 VAC 25-151?      ☒ Yes    ☐ No

A No Exposure Certification statement was submitted with the application in lieu of a storm water application. The statement was reviewed and approved with the reissuance of the permit.

If "No," check one: N/A

☐ This facility does not have a design flow  $\geq 1.0$  MGD, nor is it required to have an approved POTW pretreatment program under 9 VAC 25-31-10 et seq.

☐ This facility's SIC Code(s) and activities do not fall within the categories for which a Storm Water Application submittal is required.

22. Public Notice Information: All pertinent information is on file, and may be inspected and copied by contacting Trevor Wallace at: DEQ-Valley Regional Office, P.O. Box 3000, Harrisonburg, Virginia 22801, Telephone No. (540) 574-7807, [thwallace@deq.virginia.gov](mailto:thwallace@deq.virginia.gov).

Persons may comment in writing or by email to the DEQ on the proposed permit action, and may request a public hearing, during the comment period. Comments shall include the name, address, and telephone number of the writer, and shall contain a complete, concise statement of the factual basis for comments. Only those comments received within this period will be considered. The DEQ may decide to hold a public hearing if public response is significant. Requests for public hearings shall state the reason why a hearing is requested, the nature of the issues proposed to be raised in the public hearing and a brief explanation of how the requester's interests would be directly and adversely affected by the proposed permit action. Following the comment period, the Board will make a determination regarding the proposed permit action. This determination will become effective, unless the DEQ grants a public hearing. Due notice of any public hearing will be given.

23. Historical Record:

EVENT	DATE
VPDES PERMIT ISSUANCE w/ DAF = 5.0 MGD. Limits for: CBOD <sub>5</sub> , NH <sub>3</sub> -N, TSS, TRC, DO, pH	2/7/85
VPDES PERMIT MODIFICATION w/ DAF = 5.0 MGD. Limits for: CBOD <sub>5</sub> , NH <sub>3</sub> -N, TSS, TRC, DO, pH	2/11/87
VPDES PERMIT REISSUANCE w/ DAF = 6.25 MGD. Limits for: CBOD <sub>5</sub> , NH <sub>3</sub> -N, TSS, TRC, DO, pH, Fecal Coliform	2/11/91
VPDES PERMIT REISSUANCE w/ DAF = 6.25 MGD. Limits for: CBOD <sub>5</sub> , NH <sub>3</sub> -N, TSS, TRC, DO, pH, Fecal Coliform	2/1/96
VPDES PERMIT MODIFICATION w/ DAF = 6.25 MGD and an additional flow tier w/ DAF = 8.4 MGD (Jun-Nov), 16.0 MGD (Dec-May). Limits for: CBOD <sub>5</sub> , NH <sub>3</sub> -N, TSS, TRC, DO, pH, Fecal Coliform. Quarterly monitoring for TN and TP.	6/24/97
VPDES PERMIT REISSUANCE w/ DAF = 8.4 MGD (Jun-Nov), 16.0 MGD (Dec-May). Limits for: CBOD <sub>5</sub> , NH <sub>3</sub> -N, TSS, TRC, DO, pH, Fecal Coliform. Quarterly monitoring for TN and TP.	2/11/01
VPDES PERMIT REISSUANCE w/ DAF = 8.4 MGD and Seasonal (Dec-May) Flow Tier of 16.0 MGD. Expanded Flow Tiers w/ DAF = 10.4 MGD & 12.6 MGD. Limits for: BOD <sub>5</sub> (Jun-Nov), CBOD <sub>5</sub> (Dec-May), NH <sub>3</sub> -N, TSS, TRC, DO, pH, E. Coli, TN, TP.	Pending

## APPENDIX A

### DESCRIPTION OF WASTEWATERS AND TREATMENT FACILITIES

The Opequon Water Reclamation Facility (OWRF) utilizes a conventional activated sludge system (designed for biological nutrient removal) to treat sewage from a variety of sources in Winchester and neighboring areas of Frederick County. These sources include domestic waste as well as commercial, industrial, and institutional facility wastes. The OWRF facilities are depicted in the process flow diagram included in this Appendix.

Current annual average daily flow rate = 7.8 MGD

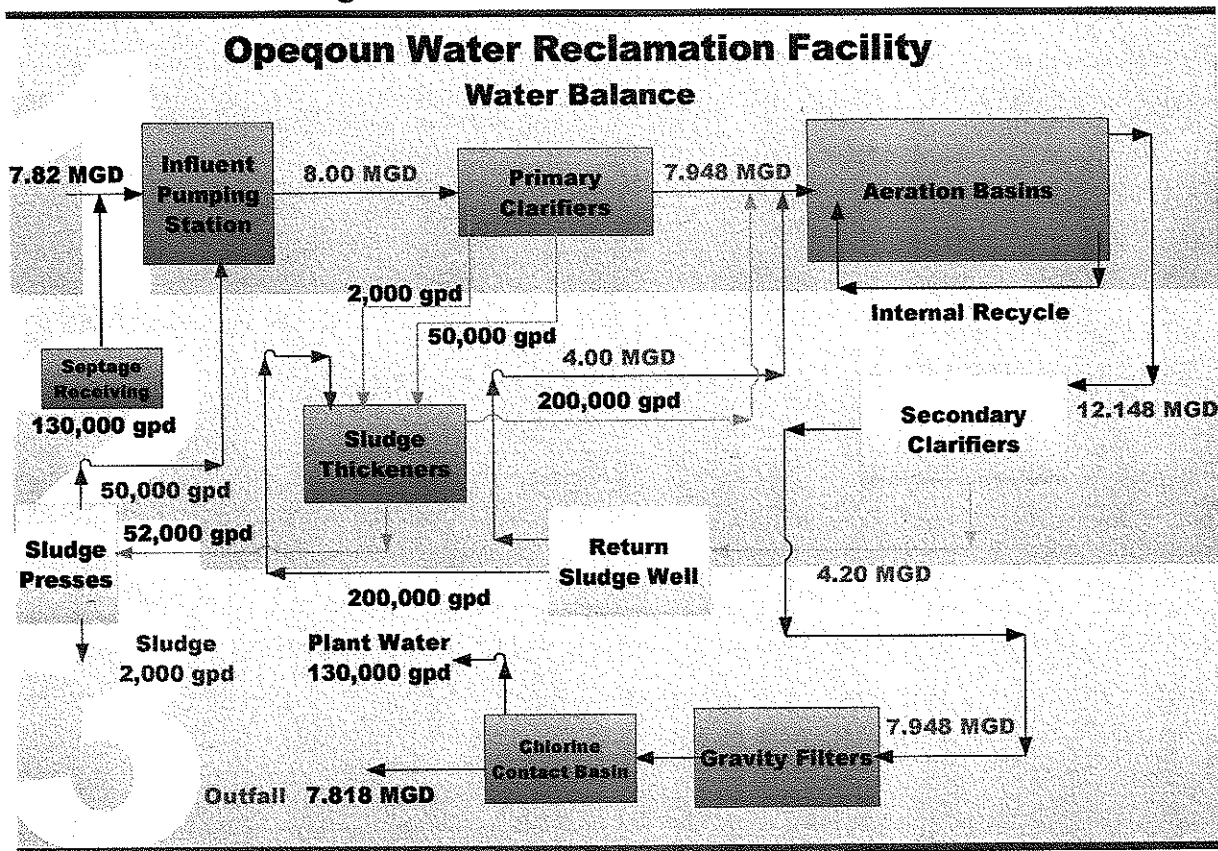
Interim Flow Tier 1 – Design Capacity = 8.4 MGD (Jun – Nov), 16.0 MGD (Dec – May)

Final Flow Tier 1 – Design Capacity = 8.4 MGD

Flow Tier 2 – Design Capacity = 10.4 MGD

Flow Tier 3 – Design Capacity = 12.6 MGD

### Process Flow Diagram



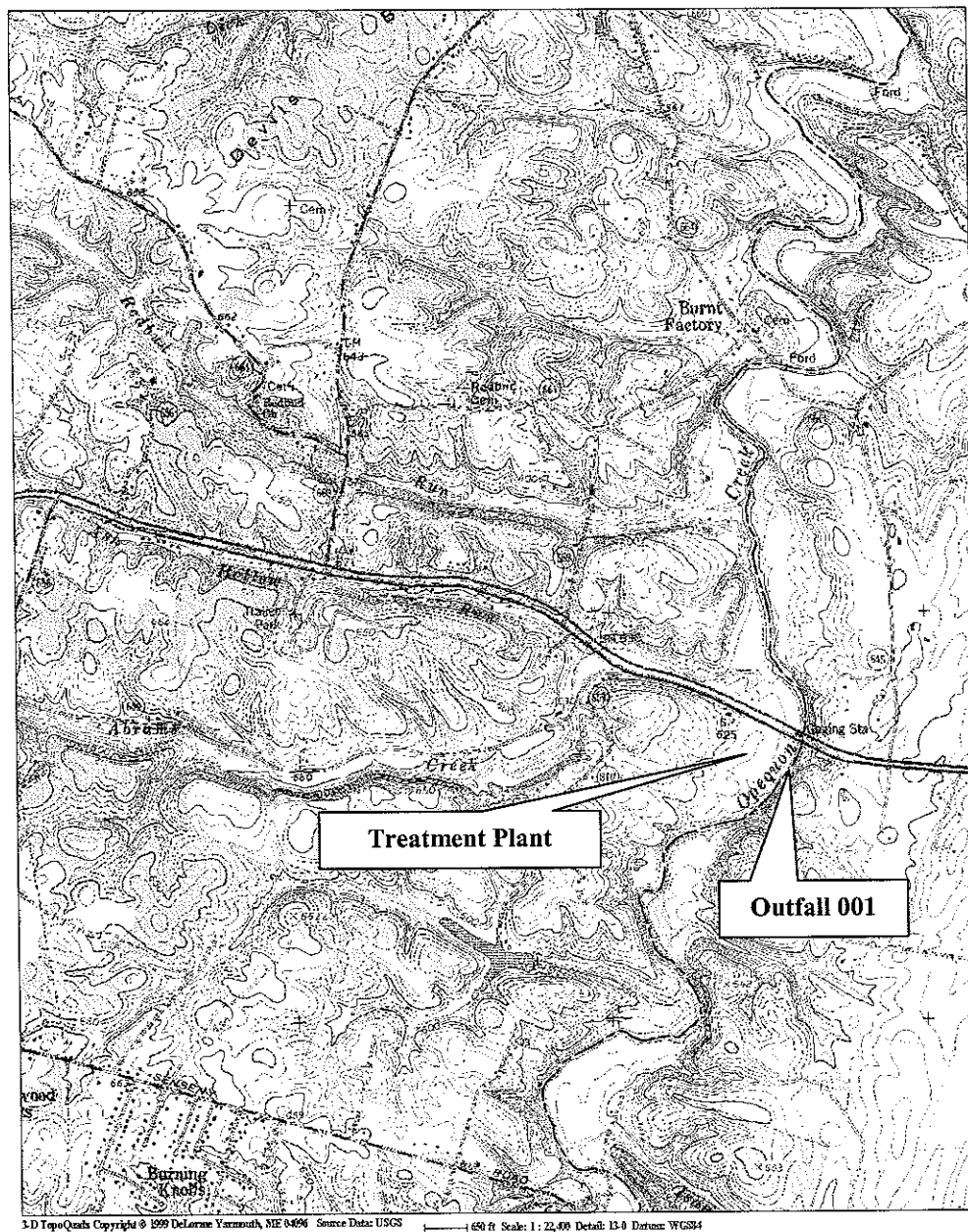
## Acclamation Facility

## APPENDIX B

OWRF discharges to Opequon Creek in Frederick County. The topographical maps below indicate the location of the treatment plant and Outfall 001.

Relevant points of interest within the watershed of the Potomac River and in the vicinity of the subject discharge are shown on the Water Quality Assessments TMDL Review for the Potomac River Basin and the corresponding map found in this Appendix.

A Flow Frequency Determination for Opequon Creek at the discharge point was provided by memo from Eric T. Aschenbach on March 18, 2005, and is also included in this Appendix.



## MIXING ZONE ANALYSES

Mixing zone analyses were conducted at Outfall 001 for the annual and wet season stream flows using DEQ's mixing program (MIX.EXE). The results are used to determine the percentage of the total receiving stream flow available for mixing and dilution of the effluent. The results are as tabulated below:

Critical Annual Flow Mixing Conditions	Critical Annual Flow Mixing Conditions
<p><u><i>Design Flow of 8.4 MGD</i></u></p> <p>Effluent Flow = 8.4 MGD  Stream 7Q10 = 0.97 MGD  Stream 30Q10 = 1.42 MGD  Stream 1Q10 = 0.71 MGD  Stream slope = 0.00114 ft/ft  Stream width = 40 ft  Bottom scale = 3  Channel scale = 1</p> <hr/> <p>Mixing Zone Predictions @ 7Q10  Depth = .8851 ft  Length = 1643.41 ft  Velocity = .4096 ft/sec  Residence Time = .0464 days</p> <p>Recommendation: A complete mix assumption is appropriate for this situation and the entire 7Q10 may be used.</p> <hr/> <p>Mixing Zone Predictions @ 30Q10  Depth = .9108 ft  Length = 1603.14 ft  Velocity = .4172 ft/sec  Residence Time = .0445 days</p> <p>Recommendation: A complete mix assumption is appropriate for this situation and the entire 30Q10 may be used.</p> <hr/> <p>Mixing Zone Predictions @ 1Q10  Depth = .8701 ft  Length = 1667.69 ft  Velocity = .4052 ft/sec  Residence Time = 1.1433 hours</p> <p>Recommendation: A complete mix assumption is appropriate for this situation providing no more than 87.46% of the 1Q10 is used.</p>	<p><u><i>Design Flow of 10.4 MGD</i></u></p> <p>Effluent Flow = 10.4 MGD  Stream 7Q10 = 0.97 MGD  Stream 30Q10 = 1.42 MGD  Stream 1Q10 = 0.71 MGD  Stream slope = 0.00114 ft/ft  Stream width = 42 ft  Bottom scale = 3  Channel scale = 1</p> <hr/> <p>Mixing Zone Predictions @ 7Q10  Depth = .9661 ft  Length = 1682.2 ft  Velocity = .4338 ft/sec  Residence Time = .0449 days</p> <p>Recommendation: A complete mix assumption is appropriate for this situation and the entire 7Q10 may be used.</p> <hr/> <p>Mixing Zone Predictions @ 30Q10  Depth = .9893 ft  Length = 1648.19 ft  Velocity = .4404 ft/sec  Residence Time = .0433 days</p> <p>Recommendation: A complete mix assumption is appropriate for this situation and the entire 30Q10 may be used.</p> <hr/> <p>Mixing Zone Predictions @ 1Q10  Depth = .9526 ft  Length = 1702.82 ft  Velocity = .4299 ft/sec  Residence Time = 1.1004 hours</p> <p>Recommendation: A complete mix assumption is appropriate for this situation providing no more than 90.88% of the 1Q10 is used.</p>
Virginia DEQ Mixing Zone Analysis Version 2.1	

**Critical Annual Flow Mixing Conditions**

**Design Flow of 12.6 MGD**

Effluent Flow = 12.6 MGD  
Stream 7Q10 = 0.97 MGD  
Stream 30Q10 = 1.42 MGD  
Stream 1Q10 = 0.71 MGD  
Stream slope = 0.00114 ft/ft  
Stream width = 45 ft  
Bottom scale = 3  
Channel scale = 1

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**Mixing Zone Predictions @ 7Q10**

Depth = 1.0306 ft  
Length = 1830.03 ft  
Velocity = .4529 ft/sec  
Residence Time = .0468 days

Recommendation: A complete mix assumption is appropriate for this situation and the entire 7Q10 may be used.

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**Mixing Zone Predictions @ 30Q10**

Depth = 1.0514 ft  
Length = 1798.83 ft  
Velocity = .4587 ft/sec  
Residence Time = .0454 days

Recommendation: A complete mix assumption is appropriate for this situation and the entire 30Q10 may be used.

-----  
**Mixing Zone Predictions @ 1Q10**

Depth = 1.0185 ft  
Length = 1848.77 ft  
Velocity = .4495 ft/sec  
Residence Time = 1.1424 hours

Recommendation: A complete mix assumption is appropriate for this situation providing no more than 87.53% of the 1Q10 is used.

Virginia DEQ Mixing Zone Analysis Version 2.1

**Fact Sheet – VPDES Permit No. VA0065552– Opequon Water Reclamation Facility**

Critical Wet Season Flow Mixing Conditions	Critical Wet Season Flow Mixing Conditions
<u><b>Design Flow of 8.4 MGD</b></u>	<u><b>Design Flow of 10.4 MGD</b></u>
Effluent Flow = 8.4 MGD Stream 7Q10 = 2.65 MGD Stream 30Q10 = 4.33 MGD Stream 1Q10 = 2.0 MGD Stream slope = 0.00114 ft/ft Stream width = 41 ft Bottom scale = 3 Channel scale = 1	Effluent Flow = 10.4 MGD Stream 7Q10 = 2.65 MGD Stream 30Q10 = 4.33 MGD Stream 1Q10 = 2.0 MGD Stream slope = 0.00114 ft/ft Stream width = 44 ft Bottom scale = 3 Channel scale = 1
----- Mixing Zone Predictions @ 7Q10 Depth = .9639 ft Length = 1605.14 ft Velocity = .4328 ft/sec Residence Time = .0429 days  Recommendation: A complete mix assumption is appropriate for this situation and the entire 7Q10 may be used.	----- Mixing Zone Predictions @ 7Q10 Depth = 1.0207 ft Length = 1763.18 ft Velocity = .4498 ft/sec Residence Time = .0454 days  Recommendation: A complete mix assumption is appropriate for this situation and the entire 7Q10 may be used.
----- Mixing Zone Predictions @ 30Q10 Depth = 1.051 ft Length = 1489.38 ft Velocity = .4573 ft/sec Residence Time = .0377 days  Recommendation: A complete mix assumption is appropriate for this situation and the entire 30Q10 may be used.	----- Mixing Zone Predictions @ 30Q10 Depth = 1.0991 ft Length = 1653.95 ft Velocity = .4715 ft/sec Residence Time = .0406 days  Recommendation: A complete mix assumption is appropriate for this situation and the entire 30Q10 may be used.
----- Mixing Zone Predictions @ 1Q10 Depth = .9288 ft Length = 1657.35 ft Velocity = .4227 ft/sec Residence Time = 1.0891 hours  Recommendation: A complete mix assumption is appropriate for this situation providing no more than 91.82% of the 1Q10 is used.	----- Mixing Zone Predictions @ 1Q10 Depth = .9893 ft Length = 1811.37 ft Velocity = .441 ft/sec Residence Time = 1.141 hours  Recommendation: A complete mix assumption is appropriate for this situation providing no more than 87.64% of the 1Q10 is used.
Virginia DEQ Mixing Zone Analysis Version 2.1	

**Fact Sheet – VPDES Permit No. VA0065552– Opequon Water Reclamation Facility**

Critical Wet Season Flow Mixing Conditions	Critical Wet Season Flow Mixing Conditions
<p align="center"><u><b>Design Flow of 12.6 MGD</b></u></p> <p>Effluent Flow = 12.6 MGD  Stream 7Q10 = 2.65 MGD  Stream 30Q10 = 4.33 MGD  Stream 1Q10 = 2.0 MGD  Stream slope = 0.00114 ft/ft  Stream width = 47 ft  Bottom scale = 3  Channel scale = 1</p> <hr/> <p>Mixing Zone Predictions @ 7Q10  Depth = 1.077 ft  Length = 1924.49 ft  Velocity = .4664 ft/sec  Residence Time = .0478 days</p> <p>Recommendation: A complete mix assumption is appropriate for this situation and the entire 7Q10 may be used.</p> <hr/> <p>Mixing Zone Predictions @ 30Q10  Depth = 1.148 ft  Length = 1821.32 ft  Velocity = .4857 ft/sec  Residence Time = .0434 days</p> <p>Recommendation: A complete mix assumption is appropriate for this situation and the entire 30Q10 may be used.</p> <hr/> <p>Mixing Zone Predictions @ 1Q10  Depth = 1.0487 ft  Length = 1969.12 ft  Velocity = .4585 ft/sec  Residence Time = 1.1929 hours</p> <p>Recommendation: A complete mix assumption is appropriate for this situation providing no more than 83.83% of the 1Q10 is used.</p>	<p align="center"><u><b>Design Flow of 16.0 MGD</b></u></p> <p>Effluent Flow = 16.0 MGD  Stream 7Q10 = 2.65 MGD  Stream 30Q10 = 4.33 MGD  Stream 1Q10 = 2.00 MGD  Stream slope = 0.00114 ft/ft  Stream width = 50 ft  Bottom scale = 3  Channel scale = 1</p> <hr/> <p>Mixing Zone Predictions @ 7Q10  Depth = 1.1714 ft  Length = 2029.43 ft  Velocity = .4929 ft/sec  Residence Time = .0477 days</p> <p>Recommendation: A complete mix assumption is appropriate for this situation and the entire 7Q10 may be used.</p> <hr/> <p>Mixing Zone Predictions @ 30Q10  Depth = 1.2348 ft  Length = 1939.1 ft  Velocity = .5097 ft/sec  Residence Time = .044 days</p> <p>Recommendation: A complete mix assumption is appropriate for this situation and the entire 30Q10 may be used.</p> <hr/> <p>Mixing Zone Predictions @ 1Q10  Depth = 1.1463 ft  Length = 2067.69 ft  Velocity = .4862 ft/sec  Residence Time = 1.1814 hours</p> <p>Recommendation: A complete mix assumption is appropriate for this situation providing no more than 84.65% of the 1Q10 is used.</p>
Virginia DEQ Mixing Zone Analysis Version 2.1	

WATER QUALITY ASSESSMENTS TMDL REVIEW  
POTOMAC-SHENANDOAH RIVER BASIN  
6/20/2005

**IMPAIRED SEGMENT:**

<u>SEGMENT ID</u>	<u>STREAM</u>	<u>SEGMENT START</u>	<u>SEGMENT END</u>	<u>LENGTH</u>	<u>PARAMETER</u>
VAV-B08R-01	Opequon Creek	57.26	32.38	24.88 - Miles	Fecal Coli, Gen Std-Benthic
VAV-B09R-01	Abrams Creek	10.8	0	10.8 - Miles	Fecal Coli, Gen Std-Benthic
VAV-B09R-02	Opequon Creek	32.38	23.56	8.82 - Miles	Fecal Coli, Gen Std-Benthic
VAV-B09R-03	Lick Run	8.87	0	8.87 - Miles	Fecal Coliform
VAV-B09R-04	Redbud Run	8.07	0	8.07 - Miles	Fecal Coli, Gen Std-Benthic

<u>PERMIT:</u>	<u>FACILITY:</u>	<u>STREAM:</u>	<u>MILE</u>	<u>LAT</u>	<u>LONG</u>	<u>WBID</u>
VA0023116	I-81 Rest Area STP	Littlers Run(Hot Run)	3.22	391431	780617	VAV-B09R
VA0029653	County Court Reporters STP	Lick Run	0.8	391257	780456	VAV-B09R
VA0058025	Plumly, P.W.	Town Run	1.04	391055	780947	VAV-B09R
VA0062693	Shenandoah Mobile Court STP	Buffalo Lick Run X Trib	0.78	390728	780914	VAV-B08R
<b>VA0065552</b>	<b>Opequon WRF</b>	<b>Opequon Creek</b>	<b>32.66</b>	<b>391036</b>	<b>780429</b>	<b>VAV-B08R</b>
VA0075191	Parkins Mill STP	Opequon Creek	43.99	390627	780913	VAV-B08R
VA0087815	Fay Spring WTP	Redbud Run X-Trib	0.02	391218	780753	VAV-B09R
VA0088471	Frederick County Landfill	Opequon Creek	36.19	390837	780525	VAV-B08R
VA0089010	Franciscan Center	Opequon Creek X-Trib	0.23	390547	780815	VAV-B08R
VA0090808	APAC Virginia WWTP	Hot Run X-Trib	0.384	391426	780622	VAV-B09R

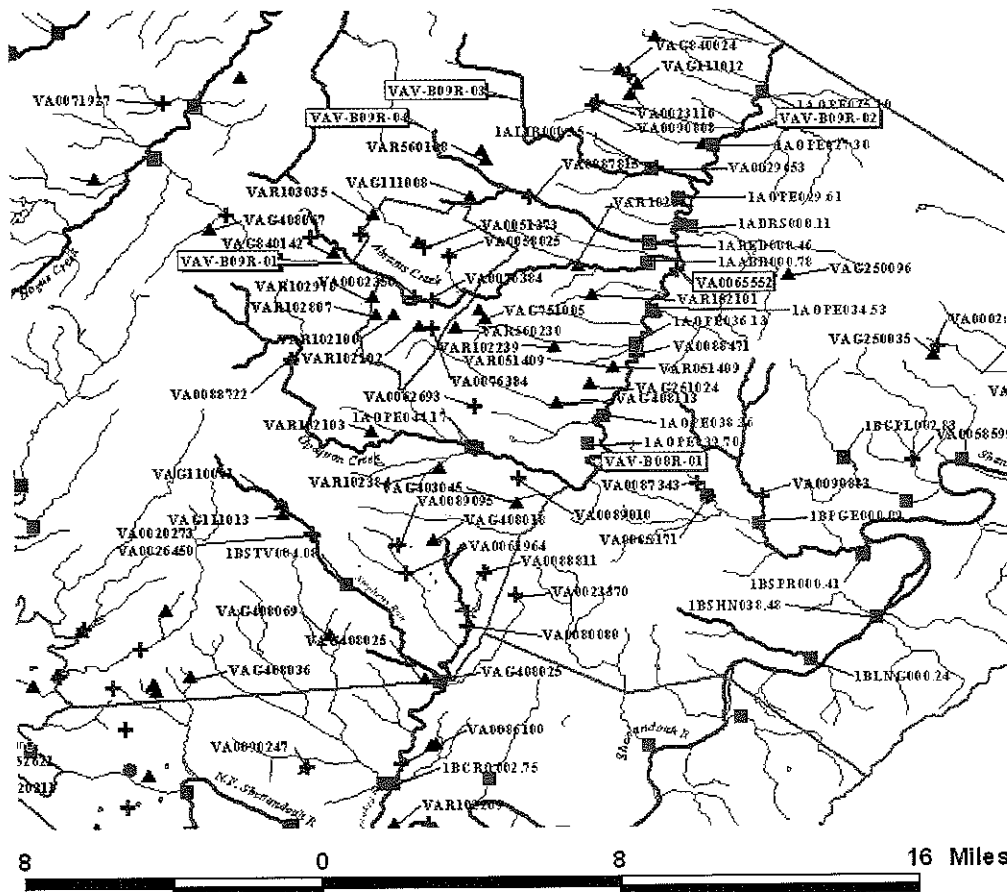
**MONITORING STATIONS**

<u>STREAM</u>	<u>NAME</u>	<u>MILE</u>	<u>RECORD</u>	<u>LAT</u>	<u>LONG</u>
Opequon Creek	1AOPE029.61	29.61	1984	391215	780427
Lick Run	1ALIR000.95	0.95	7/1/91	391255	780502
Opequon Creek	1AOPE025.10	25.1	4/25/79	391443	780227
Opequon Creek	1AOPE038.36	38.36	7/1/97	390713	780614
Opequon Creek	1AOPE044.17	44.17	8/1/01	390630	780921
Opequon Creek	1AOPE031.26	31.26	7/1/03	391136	780426
Opequon Creek	1AOPE027.30	27.3	7/1/03	391328	780337
Dry Marsh Run	1ADRS000.11	0.11	7/1/03	391135	780409
Opequon Creek	1AOPE044.01	44.01	3/12/01	390627	780912
Opequon Creek	1AOPE039.70	39.7	7/1/01	390633	780637
Abrams Creek	1AABR000.78	0.78	8/25/76	391043	780508
Opequon Creek	1AOPE036.13	36.13	7/1/91	390852	780526
Redbud Run	1ARED000.46	0.46	7/1/91	391113	780505

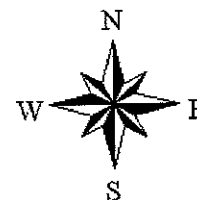
**PUBLIC WATER SUPPLY INTAKES:**

<u>OWNER:</u>	<u>STREAM:</u>	<u>RIVER</u>
None		<u>MILE:</u>

# Opequon Water Reclamation Facility - TMDL Information Potomac-Shenandoah Basin June 20, 2005



- 2004 Impaired Segments
- VAV-B09R-01 Opequon Creek  
Gen Std-Benthic/Fecal Colifon
- VAV-B09R-01 Abrams Creek  
Gen Std-Benthic/Fecal Colifon
- VAV-B09R-02 Opequon Creek  
Gen Std-Benthic-Fecal Colifon
- VAV-B09R-03 Lick Run  
Fecal Coliform
- VAV-B09R-04 Redbud Run  
Gen Std-Benthic/Fecal Colifon
- PWS Intakes
- + VPDES Permits
- Bio Monitoring Stations
- Amb Monitoring Stations
- Amb/Bio Monitoring Stations
- ▲ General Permits
- Counties
- ~ Valley Streams



## MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY  
VALLEY REGIONAL OFFICE

4411 Early Road – P.O. Box 3000

Harrisonburg, VA 22801

SUBJECT: Flow Frequency Determination  
Opequon Water Reclamation Facility, VPDES Permit No. VA0065552, Frederick County

TO: Trevor Wallace → Permit Processing File

FROM: Eric Aschenbach

DATE: March 18, 2005

COPIES: File

This memo supersedes Paul Herman's flow frequency determination dated July 31, 2000.

The Opequon WRF discharges to Opequon Creek near Berryville, Virginia. While the period of record for the reference gage has not changed since the previous memo, additional stream flow frequencies that were not previously provided are required at this site for use by the permit writer in developing effluent limitations for the VPDES permit reissuance. In addition, actions have been taken to ensure this memorandum is consistent with the recent determination completed for the Parkins Mill STP modification.

The VDEQ operated a continuous record gage on Opequon Creek near Berryville, Virginia (#01615000) from 1943-1997. The gage is located downstream of the discharge point at the Route 7 bridge in Frederick County, Virginia. In July 1988, approximately 1000 feet upstream of the gage, the Opequon WRF began discharging from a 6.0 MGD facility to Opequon Creek. Therefore, the flow frequencies for the reference gage are based only on the period of record from 1943 to 1988. Since the Parkins Mill STP did not begin discharging to Opequon Creek until about September 1989, its flow did not impact the gage during the selected period of record. Due to the proximity of the gage to the Opequon WRF outfall, the values for the gage are applied directly to the discharge point. This analysis does not address any other discharges, withdrawals, or springs that may be located between the gage and the discharge point. The flow frequencies for the reference gage/discharge point are presented below.

**Opequon Creek near Berryville, VA (#01615000):**

Drainage Area = 57.4 mi <sup>2</sup>			
1Q10 =	1.1 cfs	(0.71 mgd)	High Flow 1Q10 = 3.1 cfs (2.00 mgd)
7Q10 =	1.5 cfs	(0.97 mgd)	High Flow 7Q10 = 4.2 cfs (2.65 mgd)
30Q10 =	2.2 cfs	(1.42 mgd)	High Flow 30Q10 = 6.2 cfs (4.33 mgd)
30Q5 =	3.1 cfs	(2.00 mgd)	HM = 10.2 cfs (6.59 mgd)
			Annual Average = 42.9 cfs (27.7 mgd)

The high flow months are December through May.

## APPENDIX C

**EFFLUENT LIMITATIONS**

A comparison of technology and water quality-based limits was performed, and the most stringent limits were selected. The selected limits are summarized in the table below.

**Basis for Permit Limits****Flow Tier 1: Outfall 001 – Interim Limits**

Design Flow: 8.4 MGD (Jun-Nov), 16.0 MGD (Dec-May)

PARAMETER	BASIS FOR LIMITS	EFFLUENT LIMITATIONS		MONITORING REQUIREMENTS	
		Monthly Avg.	Weekly Avg.	Frequency	Sample Type
Flow (MGD)	4, 5	NL	NL	Continuous	T/I/R
TSS (Jun – Nov)	1, 8	30 mg/L	45 mg/L	1/Month	24 HC
		950 mg/L	1400 mg/L		
TSS (Dec – May)	1, 8	30 mg/L	45 mg/L	1/Month	24 HC
		1400 kg/d	2700 kg/d		
BOD <sub>5</sub> (Jun – Nov)	3, 6, 12	7.1 mg/L	11 mg/L	1/Day	24 HC
		206.99 kg/d	350 kg/d		
CBOD <sub>5</sub> (Dec – May)	3, 6	25 mg/L	40 mg/L	1/Week	24 HC
		1514 kg/d	2400 kg/d		
Ammonia-N (Jun – Nov)	3	2.1 mg/L	2.6 mg/L	1/Week	24 HC
Ammonia-N (Dec – May)	3	3.3 mg/L	4.1 mg/L	1/Day	24 HC
E. coli (geometric mean)	3, 8	126 N/100 mL	NA	3 Days/Week @ 48-Hour Intervals 10 a.m. – 4 p.m.	Grab
TRC, Effluent *	3	0.0087 mg/L	0.011 mg/L	1/Day	Grab
		Minimum	Maximum		
TRC, Chlorine Contact Tank *	2, 3	0.25 mg/L	NA	1/Hour	Grab
pH	3	6.5 S.U.	9.5 S.U.	1/Day	Grab
Dissolved Oxygen	3, 6	7.1 mg/L	NA	1/Day	Grab
Total Nitrogen	7	See page C5 for effluent nutrient limitations and monitoring requirements.			
Total Phosphorus	7	See page C5 for effluent nutrient limitations and monitoring requirements.			

NL = No Limitation, monitoring required  
NA = Not Applicable

T/I/R = Totalizing, Indicating, and Recording equipment  
24 HC = 24 Hour composite sample

\* Applicable only if chlorination is used for disinfection.

NOTE: See page C6 for effluent limitations bases.

# Fact Sheet – VPDES Permit No. VA0065552 – Opequon Water Reclamation Facility

## Flow Tier 1: Outfall 001 – Final Limits

Design Flow: 8.4 MGD

PARAMETER	BASIS FOR LIMITS	EFFLUENT LIMITATIONS		MONITORING REQUIREMENTS	
		Monthly Avg.	Weekly Avg.	Frequency	Sample Type
Flow (MGD)	4, 5	NL	NL	Continuous	T/I/R
TSS	1, 8	30 mg/L	45 mg/L	1/Month	24 HC
		950 mg/L	1400 mg/L		
BOD <sub>5</sub> (Jun – Nov)	3, 6, 12	7.1 mg/L	11 mg/L	1/Day	24 HC
		206.99 kg/d	350 kg/d		
CBOD <sub>5</sub> (Dec – May)	3, 6	25 mg/L	40 mg/L	1/Week	24 HC
		790 kg/d	1300 kg/d		
Ammonia-N (Jun – Nov)	3	2.1 mg/L	2.6 mg/L	1/Day	24 HC
Ammonia-N (Dec – May)	3	3.8 mg/L	4.7 mg/L	1/Day	24 HC
E. coli (geometric mean)	3, 8	126 N/100 mL	NA	3 Days/Week @ 48-Hour Intervals 10 a.m. – 4 p.m.	Grab
TRC, Effluent *	3	0.0087 mg/L	0.011 mg/L	1/Day	Grab
		Minimum	Maximum		
Whole Effluent Toxicity	11	NA	1.61 TUc	1/Quarter	24 HC
TRC, Chlorine Contact Tank *	2, 3	0.25 mg/L	NA	1/Hour	Grab
pH	3	6.5 S.U.	9.5 S.U.	1/Day	Grab
Dissolved Oxygen	3, 6	7.1 mg/L	NA	1/Day	Grab
Total Nitrogen	7	See page C6 for effluent nutrient limitations and monitoring requirements.			
Total Phosphorus	7	See page C6 for effluent nutrient limitations and monitoring requirements.			

NL = No Limitation, monitoring required

NA = Not Applicable

T/I/R = Totalizing, Indicating, and Recording equipment

24 HC = 24 Hour composite sample

\* Applicable only if chlorination is used for disinfection.

NOTE: See page C6 for effluent limitations bases.

# Fact Sheet – VPDES Permit No. VA0065552 – Opequon Water Reclamation Facility

## Flow Tier 2: Outfall 001 – Final Limits

Design Flow: 10.4 MGD

PARAMETER	BASIS FOR LIMITS	EFFLUENT LIMITATIONS		MONITORING REQUIREMENTS	
		Monthly Avg.	Weekly Avg.	Frequency	Sample Type
Flow (MGD)	4, 5	NL	NL	Continuous	T/I/R
TSS	1, 8	30 mg/L	45 mg/L	1/Month	24 HC
		1200 mg/L	1800 mg/L		
BOD <sub>5</sub> (Jun – Nov)	3, 6, 12	7.1 mg/L	11 mg/L	1/Day	24 HC
		206.99 kg/d	430 kg/d		
CBOD <sub>5</sub> (Dec – May)	3, 6	25 mg/L	40 mg/L	1/Week	24 HC
		980 kg/d	1600 kg/d		
Ammonia-N (Jun – Nov)	3	2.1 mg/L	2.6 mg/L	1/Day	24 HC
Ammonia-N (Dec – May)	3	3.6 mg/L	4.4 mg/L	1/Day	24 HC
E. coli (geometric mean)	3, 8	126 N/100 mL	NA	3 Days/Week @ 48-Hour Intervals 10 a.m. – 4 p.m.	Grab
TRC, Effluent *	3	0.0087 mg/L	0.011 mg/L	1/Day	Grab
		Minimum	Maximum		
Whole Effluent Toxicity	11	NA	1.59 TUC	1/Quarter	24 HC
TRC, Chlorine Contact Tank *	2, 3	0.25 mg/L	NA	1/Hour	Grab
pH	3	6.5 S.U.	9.5 S.U.	1/Day	Grab
Dissolved Oxygen	3, 6	7.1 mg/L	NA	1/Day	Grab
Total Nitrogen	7	See page C6 for effluent nutrient limitations and monitoring requirements.			
Total Phosphorus	7	See page C6 for effluent nutrient limitations and monitoring requirements.			

NL = No Limitation, monitoring required  
NA = Not Applicable

T/I/R = Totalizing, Indicating, and Recording equipment  
24 HC = 24 Hour composite sample

\* Applicable only if chlorination is used for disinfection.

NOTE: See page C6 for effluent limitations bases.

**Fact Sheet – VPDES Permit No. VA0065552 – Opequon Water Reclamation Facility**

**Flow Tier 3: Outfall 001 – Final Limits**

Design Flow: 12.6 MGD

PARAMETER	BASIS FOR LIMITS	EFFLUENT LIMITATIONS		MONITORING REQUIREMENTS	
		Monthly Avg.	Weekly Avg.	Frequency	Sample Type
Flow (MGD)	4, 5	NL	NL	Continuous	T/I/R
TSS	1, 8	29 mg/L	44 mg/L	1/Month	24 HC
		1400 kg/d	2100 kg/d		
BOD <sub>5</sub> (Jun – Nov)	3, 6, 12	7.1 mg/L	11 mg/L	1/Day	24 HC
		206.99 kg/d	520 kg/d		
CBOD <sub>5</sub> (Dec – May)	3, 6	25 mg/L	40 mg/L	1/Week	24 HC
		1200 kg/d	1900 kg/d		
Ammonia-N (Jun – Nov)	3	2.0 mg/L	2.5 mg/L	1/Day	24 HC
Ammonia-N (Dec – May)	3	3.5 mg/L	4.3 mg/L	1/Day	24 HC
E. coli (geometric mean)	3, 8	122 N/100 mL	NA	3 Days/Week @ 48-Hour Intervals 10 a.m. – 4 p.m.	Grab
TRC, Effluent *	3	0.0087 mg/L	0.011 mg/L	1/Day	Grab
		Minimum	Maximum		
Whole Effluent Toxicity	11	NA	1.56 TUc	1/Quarter	24 HC
TRC, Chlorine Contact Tank *	2, 3	0.25 mg/L	NA	1/Hour	Grab
pH	3	6.5 S.U.	9.5 S.U.	1/Day	Grab
Dissolved Oxygen	3, 6	7.1 mg/L	NA	1/Day	Grab
Total Nitrogen	7	See page C6 for effluent nutrient limitations and monitoring requirements.			
Total Phosphorus	7	See page C6 for effluent nutrient limitations and monitoring requirements.			

NL = No Limitation, monitoring required  
NA = Not Applicable

T/I/R = Totalizing, Indicating, and Recording equipment  
24 HC = 24 Hour composite sample

\* Applicable only if chlorination is used for disinfection.

NOTE: See page C6 for effluent limitations bases.

**Fact Sheet – VPDES Permit No. VA0065552 – Opequon Water Reclamation Facility**

**Bases for Permit Limits – Interim Limits (Nutrients)**

Outfall 001- Flow Tier: 1

PARAMETER	BASIS FOR LIMITS	EFFLUENT LIMITATIONS		MONITORING REQUIREMENTS	
		Monthly Average	Maximum	Frequency	Sample Type
Total Phosphorus	7	NL (mg/L)	NA	1/Week	24 HC
		NL (lb/d)			
Total Phosphorus - Monthly (kg/mo)	7	NA	NL	1/Month	Calculated
Orthophosphate	7	NL (mg/L)	NA	1/Week	24 HC
		NL (lb/d)			
Total Kjeldahl Nitrogen	7	NL (mg/L)	NA	1/Week	24 HC
		NL (lb/d)			
Nitrate plus Nitrite	7	NL (mg/L)	NA	1/Week	24 HC
		NL (lb/d)			
Total Nitrogen	7	NL (mg/L)	NA	1/Week	Calculated
		NL (lb/d)			
Total Nitrogen – Monthly (kg/mo)	7	NA	NL	1/Month	Calculated
		Annual Average	Maximum	Frequency	Sample Type
Total Phosphorus – Year to Date	7	NL (mg/L)	NL (lb/yr)	1/Month	Calculated*
Total Phosphorus – Calendar Year	7	NL (mg/L)	NL (lb/yr)	1/Year	Calculated**
Total Nitrogen – Year to Date	7	NL (mg/L)	NL (lb/yr)	1/Month	Calculated*
Total Nitrogen – Calendar Year	7	NL (mg/L)	NL (lb/yr)	1/Year	Calculated**

NL = No Limitation, monitoring required

NA = Not Applicable

\* To be reported on a monthly basis as the cumulative loading beginning with monitoring performed during the month of January each year and ending with the monitoring performed for the month of current reporting.

\*\* To be reported on an annual basis as the total loading for the calendar year.

1) See page C6 for effluent limitations bases.

# Fact Sheet – VPDES Permit No. VA0065552 – Opequon Water Reclamation Facility

## Bases for Permit Limits – Final Limits (Nutrients)

Outfall 001- Flow Tiers: 1-3

PARAMETER	BASIS FOR LIMITS	EFFLUENT LIMITATIONS		MONITORING REQUIREMENTS	
		Monthly Average	Maximum	Frequency	Sample Type
Total Phosphorus	7	NL (mg/L)	NA	1/Week	24 HC
		NL (lb/d)			
Total Phosphorus - Monthly (kg/mo)	7	NA	NL	1/Month	Calculated
Orthophosphate	7	NL (mg/L)	NA	1/Week	24 HC
		NL (lb/d)			
Total Kjeldahl Nitrogen	7	NL (mg/L)	NA	1/Week	24 HC
		NL (lb/d)			
Nitrate plus Nitrite	7	NL (mg/L)	NA	1/Week	24 HC
		NL (lb/d)			
Total Nitrogen	7	NL (mg/L)	NA	1/Week	Calculated
		NL (lb/d)			
Total Nitrogen – Monthly (kg/mo)	7	NA	NL	1/Month	Calculated
		Annual Average	Maximum	Frequency	Sample Type
Total Phosphorus – Year to Date	7	NL (mg/L)	NL (lb/yr)	1/Month	Calculated**
Total Phosphorus – Calendar Year	7, 9, 10	0.3 mg/L*	7,675 lb/yr	1/Year	Calculated***
Total Nitrogen – Year to Date	7	NL (mg/L)	NL (lb/yr)	1/Month	Calculated**
Total Nitrogen – Calendar Year	7, 9, 10	3.0 mg/L*	102,336 lb/yr	1/Year	Calculated***

NL = No Limitation, monitoring required

NA = Not Applicable

\* Limitation not applicable to Flow Tier 1.

\*\* To be reported on a monthly basis as the average concentration and cumulative loading beginning with monitoring performed during the month of January each year and ending with the monitoring performed for the month of current reporting.

\*\*\* To be reported on an annual basis as the average concentration and total loading for the calendar year.

## Bases for Effluent Limitations

1. Federal Effluent Guidelines and Standards – 40 CFR 133
2. Best Professional Judgement (BPJ)
3. Water Quality Standards
4. VPDES Permit Manual
5. VPDES Regulations
6. DO model presented in the Opequon Creek Capacity Study report dated March 2005 with all subsequent information and model runs (see attached).
7. Guidance Memo No. 05-2009 for facilities on the DEQ Chesapeake Bay Program's List of Significant Discharges.
8. Opequon Creek TMDL for bacteria and suspended solids. Approved 2/18/04.
9. Code of Virginia 62.1-44.19:12 – 19
10. Final Regulation (Rev. June 16, 2005) 9 VAC 25-720 *et seq.*
11. 11/29/05 TMP Evaluation
12. Water Quality Management Plan

## Fact Sheet – VPDES Permit No. VA0065552 – Opequon Water Reclamation Facility

The following potential limiting factors have been considered in developing this permit and fact sheet:

Water Quality Management Plan (WQMP)	<b>BOD, CBOD, TN, TP</b>
TMDL limits	<b>TSS, E. coli</b>
Federal Effluent Guidelines	<b>TSS, CBOD</b>
BPJ/Agency Guidance limits	<b>TRC (contact)</b>
Water Quality-based limits	<b>BOD, CBOD, DO, TRC (effluent), Ammonia-N, E. coli, pH</b>
Toxics Management Plan (TMP) analysis	<b>WET</b>
Storm Water limits	<b>Not Applicable</b>

### EVALUATION OF EFFLUENT CONVENTIONAL POLLUTANTS

A site inspection was not performed at this reissuance, in lieu of the extensive field work performed by the owner's consultant as part of the Opequon Creek Capacity Study (OCCS) (included in this fact sheet) completed in March 2005. Opequon Creek was observed by the permit writer in February 2005. Based on the assessment from that time, the stream conditions presented in the OCCS report appear accurate.

The discharge from the current facility was first modeled in January 1997 by HydroQual, Inc using the proprietary flow model DIURNAL. The discharge was remodel by HydroQual in March 2005 and submitted as part of the OCCS report. DIURNAL was again used as the model base. The revised model encompasses the Parkins Mills WWTF (VA0075191) and Frederick County Landfill (VA0088471) discharges and continues approximately 14 miles downstream of the OWRF discharge, terminating at the confluence of Opequon Creek and Turkey Run in West Virginia. Ammonia-N limits were calculated as part of the 1997 model effort, but were not included in the 2005 report. As such, only (C)BOD and DO limits will be based on the 2005 model data, while ammonia-N limits will be determined per the DEQ toxics evaluation presented in this Appendix. The CBOD and D.O. concentration limits recommended by the model are included in the Effluent Limitation tables included in this appendix. In addition to the concentration based CBOD limits, the Water Quality Management Plan for Opequon Creek limits this discharge to 206.99 kg/d BOD<sub>5</sub> (Jun-Nov) and 1514 kg/d CBOD<sub>5</sub> (Dec-May). Because the WQMP specifies the dry season loading as BOD, and not CBOD, the concentration limit was also specified as BOD. The (C)BOD and DO limits applied to the permit at this reissuance were evaluated to be protective of downstream dissolved oxygen WQS's.

Based on the model, it was determined that no TKN limits were needed because the ammonia-N and total nitrogen (TN) limits imposed in this permit will control the effluent TKN.

TSS limits comply with secondary treatment limits and the facility's TSS wasteload allocation included in the Opequon Creek TMDL, approved February 18, 2004.

pH limits reflect the current Water Quality Standard for pH in the receiving stream and limits have been carried forward from the previous permit.

In accordance with current guidance and a change in the WQS, new E. coli limits and monitoring requirements have been imposed in the reissued permit to replace the existing fecal coliform limits. Per the previous permit, bacteria limitations and monitoring requirement are required by the current facility and continue to apply should an alternate to chlorine disinfection be used. These requirements were also applied to the expanded facilities. The 12.6 MGD E. coli limit was adjusted below the WQS of 126 cfu/100mL to comply with the TMDL bacteria loading requirements.

## EVALUATION OF NUTRIENTS

Significant portions of the Chesapeake Bay and its tributaries are listed as impaired on Virginia's 303(d) list of impaired waters for not meeting the aquatic life use support goal, and the 2004 Virginia Water Quality Assessment 305(b)/303(d) Integrated Report indicates that 83% of the mainstem Bay does not fully support this use support goal under Virginia's water quality assessment guidelines. Nutrient enrichment is cited as one of the primary causes for impairment.

Guidance Memorandum (GM) 05-2009\* implements DEQ's best professional judgment decision to limit nutrient loadings from facilities listed on the Chesapeake Bay Program Significant Discharger List and complies with the requirements set forth in 9 VAC 25-720 *et seq.* GM 05-2009 provides the basis for this decision and specifies the procedure for determining and applying annual nutrient loading limitations and monitoring requirements to SDL facilities. GM 05-2009 also establishes that discharges be required to: monitor and report nutrient effluent loads; submit a Basis of Design Report to construct and operate a range of nutrient removal technologies; and submit an Interim Optimization Plan for the removal with the existing facility. In accordance with the guidance memorandum, this permit contains special conditions requiring submittal of these reports.

This facility appears on the current DEQ Chesapeake Bay Program's Significant Discharger List.  
(see: <http://www.deq.virginia.gov/bay/VASignificantListbyVPDES.pdf>)

- \* Guidance Memo No. 05-2009, VPDES Nutrient Limitations for Significant Discharges to the Chesapeake Bay Watershed, May 24, 2005.

GM 05-2009 specifies that facilities that are included on the CBP SDL should, upon permit reissuance, contain a minimum level of nutrient monitoring and a four year schedule of compliance for meeting the annual nutrient loading limitation. As such, nutrient monitoring and limitations were applied to all permit flow tiers. A four schedule of compliance was allowed for the existing facility (Interim Flow Tier 1) to meet the TN and total phosphorus (TP) WLA's. Annual concentration based nutrient limitations as well as annual WLA's were applied to Flow Tiers 2, 3, and 4 in accordance with Code of Virginia 62.1-44.19:12 – 19. Where a facility expansion results in an annual discharge greater than the facilities allocated load, it is intended that the facility will be required to offset the additional load via a nutrient trading program. Any annual Total Nitrogen and/or Total Phosphorus loadings above and beyond those specified by the permit shall be offset subject to a DEQ-approved trading contract prepared in accordance with sections 62.1-44.19:12 - :19 of the law and any regulations.

The permit includes a general permit (GP) clause that will allow the permittee to obtain coverage under the future nutrient general permit. Per current planning, the GP will establish a formal nutrient trading program through which the OWRF may, if necessary, purchase nutrient credits and/or establish non-point source Best Management Practices sufficient to meet the GP requirements and the annual nutrient load allocations.

The Water Quality Management Plan (9 VAC 25-720), adopted by the State Water Control Board on September 26, 2005, lists nutrient loading limits for this facility in pounds per year. The draft permit will apply the nutrient loading limits in kilograms per year rounded to the nearest whole number using DEQ's guidance on rounding.

The final annual Total Nitrogen and Total Phosphorus load limitations for Opequon Water Reclamation Facility are 102,331 lb/yr (46,417 kg/yr) and 7,675 lb/yr (3,481 kg/yr) respectively.

EVALUATION OF EFFLUENT TOXIC POLLUTANTS

Data Input Form for WQS.WLA Spreadsheet

Discharge: Effluent pH and temperature values were obtained from the monthly Discharge Monitoring Reports (DMRs) submitted by the facility. The effluent hardness was obtained from data included in the permit application submitted for this reissuance.

Table 2. Effluent Data	
90% pH (SU) =	7.7
10% pH (SU) =	7.4
90% Annual Temp (°C) =	24.5
90% Wet Temp (°C) =	18.4
Mean Hardness (mg/L) =	326

Stream: The receiving stream pH, temperature, and hardness values were obtained from observations performed by the DEQ Water Quality Monitoring Program (WQMP) on Opequon Creek (Station ID 1AOPE036.13) at river mile 36.13. The Station ID is located approximately 3.5 miles upstream of outfall 001.

The 90<sup>th</sup> percentile annual pH was determined to be 8.5 S.U., while the 10<sup>th</sup> percentile annual pH was 7.8 S.U. The 90<sup>th</sup> percentile annual temperature was determined to be 21.9 °C and the 90<sup>th</sup> percentile wet season (December through May) temperature was 15.7 °C. The average hardness was found to be 234 mg/L CaCO<sub>3</sub>.

Note: Interim Flow Tier 1 includes dry and wet season flow conditions. During the months of June-November, the facility operates at a design flow of 8.4 MGD. During the months of December-May, the design flow is set at 16.0 MGD to account for additional dilute influent flow caused by conveyance system I&I. As a result, WLA's for the 16.0 MGD flow condition were all based on the wet season stream and effluent characteristics.

PROTOCOL FOR EVALUATION OF EFFLUENT TOXIC POLLUTANTS

Toxic pollutants were evaluated in accordance with OWP Guidance Memo No. 00-2011 (8/24/00). Acute and Chronic Waste Load Allocations ( $WLA_a$  and  $WLA_c$ ) were analyzed according to the protocol below using a statistical approach (STAT.exe) to determine the necessity and magnitude of limits. Human Health Waste Load Allocations ( $WLA_{hh}$ ) were analyzed according to the same protocol through a simple comparison with the effluent data. If the  $WLA_{hh}$  exceeded the effluent datum or data mean, no limits were required. If the effluent datum or data mean exceeded the  $WLA_{hh}$ , the  $WLA_{hh}$  was imposed as the limit. Since there are no data available for any toxic pollutants immediately upstream of this discharge, all upstream (background) pollutant concentrations are assumed to be "0".

The steps used in evaluating the effluent data are as follows:

- A. If all data are reported as "below detection" or  $<$  the required Quantification Level (QL), and at least one detection level is  $\leq$  the required QL, then the pollutant is considered to be not significantly present in the discharge and no further monitoring is required.
- B. If all data are reported as "below detection", and all detection levels are  $>$  the required QL, then an evaluation is performed in which the pollutant is assumed present at the lowest reported detection level.
  - B.1. If the evaluation indicates that no limits are needed, then the existing data set is adequate and no further monitoring is required.
  - B.2. If the evaluation indicates that limits are needed, then the existing data set is inadequate to make a determination and additional monitoring is required.
- C. If any data value is reported as detectable at or above the required QL, then the data are adequate to determine whether effluent limits are needed.
  - C.1. If the evaluation indicates that no limits are needed, then no further monitoring is required.
  - C.2. If the evaluation indicates that limits are needed, then the limits and associated requirements are specified in the draft permit.
  - C.3. (Exception for Metals data only) If the evaluation indicates that limits are needed, but the data are reported as a form other than "Dissolved", then the existing data set is inadequate to make a determination and additional monitoring is required.

TOXLARGE – Flow Tier 1

Refer to the toxic pollutant tables below for the evaluation results for each of the toxic pollutants for which effluent data exists. Based on this evaluation, additional monitoring data is needed for several parameters. The existing data for selenium and cadmium were inadequate to demonstrate they are not present in the effluent in potentially toxic concentrations. Additionally, the effluent needs to be screened for several new WQS parameters within one year of the permit effective date. The permit Attachment A1 includes a list of those parameters for which sample data is required.

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Parameter	CASRN	Type	QL (µg/L)	8.4 MGD (Jun-Nov), 16.0 MGD (Dec-May) Data (µg/L unless noted otherwise)	Source of Data	Data Eval
2,4-Dinitrophenol	51-28-5	A	—	<50, <50, <50	a	A
2,4,6-Trichlorophenol <sup>c</sup>	88-06-2	A	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
2,4-Dichlorophenol	120-83-2	A	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
2,4-Dimethylphenol	105-67-9	A	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
2-Chlorophenol	95-57-8	A	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
2-Methyl-4,6-Dinitrophenol	534-52-1	A	---	NEW REQUIREMENT. Needs to be sampled.	---	---
Pentachlorophenol <sup>c</sup>	87-86-5	A	50	New data ≤to data previously evaluated. Evaluation not required.	---	---
Phenol	108-95-2	A	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
1,2,4-Trichlorobenzene	120-82-1	B	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
1,2-Dichlorobenzene	95-50-1	B	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
1,2-Diphenylhydrazine <sup>c</sup>	122-66-7	B	---	<10, <10, <10	a	A
1,3-Dichlorobenzene	541-73-1	B	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
1,4-Dichlorobenzene	106-46-7	B	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
2,4-Dinitrotoluene <sup>c</sup>	121-14-2	B	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
2-Chloronaphthalene	91-58-7	B	---	<10, <10, <10	a	A
3,3-Dichlorobenzidine <sup>c</sup>	91-94-1	B	---	<20, <20, <20	a	A
Acenaphthene	83-32-9	B	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
Anthracene	120-12-7	B	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
Benzdine <sup>c</sup>	92-87-5	B	---	<20, <20, <20	a	A
Benzo (a) anthracene <sup>c</sup>	56-55-3	B	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
Benzo (a) pyrene <sup>c</sup>	50-32-8	B	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
Benzo (b) fluoranthene <sup>c</sup>	205-99-2	B	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
Benzo (k) fluoranthene <sup>c</sup>	207-08-9	B	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
Bis2-Chloroethyl Ether	111-44-4	B	---	NEW REQUIREMENT. Needs to be sampled.	---	---
Bis2-Chloroisopropyl Ether	39638-32-9	B	---	<10, <10, <10	a	A
Butylbenzylphthalate	85-68-7	B	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
Chrysene <sup>c</sup>	218-01-9	B	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
Di-2-Ethylhexyl Phthalate <sup>c</sup>	117-81-7	B	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
Dibenz(a,h)anthracene <sup>c</sup>	53-70-3	B	20	New data ≤to data previously evaluated. Evaluation not required.	---	---
Dibutyl phthalate (syn. = Di-n-Butyl Phthalate)	84-74-2	B	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
Diethyl Phthalate	84-66-2	B	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
Dimethyl Phthalate	131-11-3	B	---	<10, <10, <10	a	A
Fluoranthene	206-44-0	B	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
Fluorene	86-73-7	B	10	Previously evaluated, no further monitoring required.	---	---
Hexachlorobenzene <sup>c</sup>	118-74-1	B	---	<10, <10, <10	a	A
Hexachlorobutadiene <sup>c</sup>	87-68-3	B	---	<10, <10, <10	a	A
Hexachlorocyclopentadiene	77-47-4	B	---	<10, <10, <10	a	A

# Fact Sheet – VPDES Permit No. VA0065552 – Opequon Water Reclamation Facility

Parameter	CASRN	Type	QL (µg/L)	8.4 MGD (Jun-Nov), 16.0 MGD (Dec-May) Data (µg/L unless noted otherwise)	Source of Data	Data Eval
Hexachloroethane <sup>c</sup>	67-72-1	B	---	<10, <10, <10	a	A
Indeno (1,2,3-cd) pyrene <sup>c</sup>	193-39-5	B	20	New data ≤to data previously evaluated. Evaluation not required.	---	---
Isophorone <sup>c</sup>	78-59-1	B	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
Nitrobenzene	98-95-3	B	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
N-Nitrosodimethylamine <sup>c</sup>	62-75-9	B	---	<10, <10, <10	a	A
N-Nitrosodi-n-propylamine <sup>c</sup>	621-64-7	B	---	<10, <10, <10	a	A
N-Nitrosodiphenylamine <sup>c</sup>	86-30-6	B	---	<10, <10, <10	a	A
Pyrene	129-00-0	B	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
Antimony	7440-36-0	M	0.2	<2, <2, <5	a	B.1
Arsenic	7440-38-2	M	1.0	New data ≤to data previously evaluated. Evaluation not required.	---	---
Barium	7440-39-3	M	---	Applicable to PWS waters only. Evaluation not required.	---	---
Cadmium	7440-43-9	M	0.3	<5, <5, <5	a	B.2
Chromium III	16065-83-1	M	0.5	Previously evaluated. Evaluation not required.	---	---
Chromium VI	18540-29-9	M	0.5	Previously evaluated. Evaluation not required.	---	---
Chromium, Total	7440-47-3	M	---	Applicable to PWS waters only. Evaluation not required.	---	---
Copper	7440-50-8	M	0.5	6, 7, 5	a	C.1
Iron	7439-89-6	M	1.0	Applicable to PWS waters only. Evaluation not required.	---	---
Lead	7439-92-1	M	0.5	New data ≤to data previously evaluated. Evaluation not required.	---	---
Manganese	7439-96-5	M	0.2	Applicable to PWS waters only. Evaluation not required.	---	---
Mercury	7439-97-6	M	1.0	<0.3, <0.3, <0.5	a	A
Nickel	7440-02-0	M	0.5	5, <5, <5	a	C.1
Selenium	7782-49-2	M	2.0	<10, <10, <10	a	B.2
Silver	7440-22-4	M	0.2	New data ≤to data previously evaluated. Evaluation not required.	---	---
Thallium	7440-28-0	M	---	<2, <2, <5	a	A
Zinc	7440-66-6	M	2.0	New data ≤to data previously evaluated. Evaluation not required.	---	---
2-(2,4,5-Trichlorophenoxy) propionic acid (synonym = Silvex)	93-72-1	P	---	Applicable to PWS waters only. Evaluation not required.	---	---
2,4-Dichlorophenoxy acetic acid (syn. = 2,4-D)	94-75-7	P	---	Applicable to PWS waters only. Evaluation not required.	---	---
Aldrin <sup>c</sup>	309-00-2	P	0.05	Previously evaluated, no further monitoring required.	---	---
Alpha-Endosulfan (I)	959-98-8	P	---	Previously evaluated, no further monitoring required.	---	---
Beta-Endosulfan (II)	33213-65-9	P	---	Previously evaluated, no further monitoring required.	---	---
Chlordane <sup>c</sup>	57-74-9	P	0.2	Previously evaluated, no further monitoring required.	---	---
Chlorpyrifos (synonym = Dursban)	2921-88-2	P	---	Previously evaluated, no further monitoring required.	---	---
DDD <sup>c</sup>	72-54-8	P	0.1	Previously evaluated, no further monitoring required.	---	---
DDE <sup>c</sup>	72-55-9	P	0.1	Previously evaluated, no further monitoring required.	---	---
DDT <sup>c</sup>	50-29-3	P	0.1	Previously evaluated, no further monitoring required.	---	---
Demeton	8065-48-3	P	---	Previously evaluated, no further monitoring required.	---	---
Dieldrin <sup>c</sup>	60-57-1	P	---	Previously evaluated, no further monitoring required.	---	---
Endosulfan Sulfate	1031-07-8	P	---	Previously evaluated, no further monitoring required.	---	---
Endrin	72-20-8	P	0.1	Previously evaluated, no further monitoring required.	---	---
Endrin Aldehyde	7421-93-4	P	---	NEW REQUIREMENT. Needs to be sampled.	---	---
Guthion	86-50-0	P	---	Previously evaluated, no further monitoring required.	---	---

**Fact Sheet – VPDES Permit No. VA0065552 – Opequon Water Reclamation Facility**

Parameter	CASRN	Type	QL (µg/L)	8.4 MGD (Jun-Nov), 16.0 MGD (Dec-May) Data (µg/L unless noted otherwise)	Source of Data	Data Eval
Heptachlor <sup>C</sup>	76-44-8	P	0.05	Previously evaluated, no further monitoring required.	---	---
Heptachlor Epoxide <sup>C</sup>	1024-57-3	P	---	NEW REQUIREMENT. Needs to be sampled.	---	---
Hexachlorocyclohexane Alpha-BHC <sup>C</sup>	319-84-6	P	---	NEW REQUIREMENT. Needs to be sampled.	---	---
Hexachlorocyclohexane Beta-BHC <sup>C</sup>	319-85-7	P	---	NEW REQUIREMENT. Needs to be sampled.	---	---
Hexachlorocyclohexane Gamma-BHC <sup>C</sup> (syn. = Lindane)	58-89-9	P	---	Previously evaluated, no further monitoring required.	---	---
Kepone	143-50-0	P	---	<33	b	A
Malathion	121-75-5	P	---	Previously evaluated, no further monitoring required.	---	---
Methoxychlor	72-43-5	P	---	Previously evaluated, no further monitoring required.	---	---
Mirex	2385-85-5	P	---	Previously evaluated, no further monitoring required.	---	---
Parathion	56-38-2	P	---	Previously evaluated, no further monitoring required.	---	---
PCB Total <sup>C</sup>	1336-36-3	P	---	Previously evaluated, no further monitoring required.	---	---
PCB-1016	12674-11-2	P	1	Previously evaluated, no further monitoring required.	---	---
PCB-1221	11104-28-2	P	1	Previously evaluated, no further monitoring required.	---	---
PCB-1232	11141-16-5	P	1	Previously evaluated, no further monitoring required.	---	---
PCB-1242	53469-21-9	P	1	Previously evaluated, no further monitoring required.	---	---
PCB-1248	12672-29-6	P	1	Previously evaluated, no further monitoring required.	---	---
PCB-1254	11097-69-1	P	1	Previously evaluated, no further monitoring required.	---	---
PCB-1260	11096-82-5	P	1	Previously evaluated, no further monitoring required.	---	---
Toxaphene <sup>C</sup>	8001-35-2	P	5.0	Previously evaluated, no further monitoring required.	---	---
Beta Particle & Photon Activity (mrem/yr)		R	---	NEW REQUIREMENT. Needs to be sampled.	---	---
Gross Alpha Particle Activity (pCi/L)		R	---	NEW REQUIREMENT. Needs to be sampled.	---	---
Strontium-90 (pCi/L)		R	---	NEW REQUIREMENT. Needs to be sampled.	---	---
Tritium (pCi/L)		R	---	NEW REQUIREMENT. Needs to be sampled.	---	---
1,1,2,2-Tetrachloroethane <sup>C</sup>	79-34-5	V	---	<5, <5, <5	a	A
1,1,2-Trichloroethane <sup>C</sup>	79-00-5	V	---	<5, <5, <5	a	A
1,1-Dichloroethylene	75-35-4	V	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
1,2-Dichloroethane <sup>C</sup>	107-06-2	V	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
1,2-Dichloropropane <sup>C</sup>	78-87-5	V	---	<5, <5, <5	a	A
1,2-trans-dichloroethylene	156-60-5	V	---	<5, <5, <5	a	A
1,3-Dichloropropene	542-75-6	V	---	<5, <5, <5	a	A
Acrolein	107-02-8	V	---	<50, <50, <50	a	A
Acrylonitrile <sup>C</sup>	107-13-1	V	---	<50, <50, <50	a	A
Benzene <sup>C</sup>	71-43-2	V	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
Bromoform <sup>C</sup>	75-25-2	V	10	<10, <10, <10	a	A
Carbon Tetrachloride <sup>C</sup>	56-23-5	V	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
Chlorobenzene (synonym = Monochlorobenzene)	108-90-7	V	50	New data ≤to data previously evaluated. Evaluation not required.	---	---
Chlorodibromomethane <sup>C</sup>	124-48-1	V	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
Chloroform <sup>C</sup>	67-66-3	V	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
Dichlorobromomethane <sup>C</sup>	75-27-4	V	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
Dichloromethane (syn. = Methylene Chloride) <sup>C</sup>	75-09-2	V	20	New data ≤to data previously evaluated. Evaluation not required.	---	---

# Fact Sheet – VPDES Permit No. VA0065552 – Opequon Water Reclamation Facility

Parameter	CASRN	Type	QL (µg/L)	8.4 MGD (Jun-Nov), 16.0 MGD (Dec-May) Data (µg/L unless noted otherwise)	Source of Data	Data Eval
Ethylbenzene	100-41-4	V	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
Methyl Bromide	74-83-9	V	---	<10, <10, <10	a	A
Tetrachloroethylene <sup>C</sup>	127-18-4	V	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
Toluene	10-88-3	V	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
Trichloroethylene <sup>C</sup>	79-01-6	V	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
Vinyl Chloride <sup>C</sup>	75-01-4	V	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
Ammonia-N (mg/L) (Annual)	766-41-7	X	0.2 mg/L	Default = 9 mg/L	d	C.2
Ammonia-N (mg/L) (Wet Season)	766-41-7	X	0.2 mg/L	Default = 9 mg/L	d	C.2
Chloride (mg/L)	16887-00-6	X	---	See STAT.EXE RESULTS for data values	c	C.1
Cyanide	57-12-5	X	10	New data ≤to data previously evaluated. Evaluation not required.	---	---
Dioxin (2,3,7,8-tetrachlorodibenzo-p-dioxin) (ppq)	1746-01-6	X	0.00001	Applicable to Paper Mills & Oil Refineries only. Evaluation not required.	---	---
Foaming Agents		X	---	Applicable to PWS waters only. Evaluation not required.	---	---
Hydrogen Sulfide	7783-06-4	X	---	<100	b	A
Nitrate (as N)	14797-55-8	X	---	Applicable to PWS waters only. Evaluation not required.	---	---
Sulfate	14808-79-8	X	---	Applicable to PWS waters only. Evaluation not required.	---	---
Total dissolved solids		X	---	Applicable to PWS waters only. Evaluation not required.	---	---
TRC (mg/L)	7782-50-5	X	0.1 mg/L	Default = 20 mg/L	d	C.2
Tributyltin	60-10-5	X	---	Previously evaluated, no further monitoring required.	---	---

**"Type" column indicates a category assigned to the referenced substance (see below):**

A = Acid Extractable Organic Compounds  
 B = Base/Neutral Extractable Organic Compounds  
 M = Metals  
 p = PCBs  
 P = Pesticides  
 V = Volatile Organic Compounds  
 X = Miscellaneous Compounds and Parameters

The superscript "C" following the parameter name indicates that the substance is a known or suspected carcinogen; human health criteria at risk level 10<sup>-6</sup>.

**"Source of Data" codes:**

a = Data from permittee monitoring on 4/13/05, 4/16/05, 4/15/05, 4/17/05  
 Metals are in the Total Recoverable form.  
 b = Data from permittee monitoring on 12/16/03  
 c = Data from DMR's and Daily Log Reports  
 d = Default effluent concentration

**"Data Evaluation" codes:**

See section titled "EVALUATION OF EFFLUENT TOXIC POLLUTANTS" (preceding the parameter table) for an explanation of the code used.

**CASRN** = Chemical Abstract Service Registry Number for each parameter is referenced in the current Water Quality Standards. A unique numeric identifier designating only one substance. The Chemical Abstract Service is a division of the American Chemical Society.

# Fact Sheet – VPDES Permit No. VA0065552 – Opequon Water Reclamation Facility

## WQS – WLA Spreadsheet: 8.4 MGD Input

### WATER QUALITY CRITERIA / WASTE LOAD ALLOCATION ANALYSIS

Facility Name:  
Opequon Water Reclamation Facility  
Receiving Stream:  
Opequon Creek

Permit No.: VA0065552  
Date: 12/1/2005

Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information		Stream Flows		Mixing Information		Effluent Information	
Mean Hardness (as CaCO <sub>3</sub> ) =	234 mg/L	1Q10 (Annual) =	0.71 MGD	Annual	- 1Q10 Flow = 91.73 %	Mean Hardness (as CaCO <sub>3</sub> ) =	326 mg/L
90% Temperature (Annual) =	21.9 deg C	7Q10 (Annual) =	0.97 MGD		- 7Q10 Flow = 100 %	90% Temp (Annual) =	24.5 deg C
90% Temperature (Wet season) =	15.7 deg C	30Q10 (Annual) =	1.42 MGD		- 30Q10 Flow = 100 %	90% Temp (Wet season) =	18.4 deg C
90% Maximum pH =	8.5 SU	1Q10 (Wet season) =	2 MGD	Wet Season	- 1Q10 Flow = 91.82 %	90% Maximum pH =	7.7 SU
10% Maximum pH =	7.8 SU	30Q10 (Wet season) =	4.33 MGD		- 30Q10 Flow = 100 %	10% Maximum pH =	7.4 SU
Tier Designation =	1	30Q5 =	2 MGD			Current Discharge Flow =	8,400 MGD
Public Water Supply (PWS) Y/N? =	N	Harmonic Mean =	6.59 MGD			Discharge Flow for Limit Analysis =	8,400 MGD
V(alley) or P(edmont)? =	V	Annual Average =	27.7 MGD				
Trout Present Y/N? =	N						
Early Life Stages Present Y/N? =	Y						

#### Footnotes:

- All concentrations expressed as micrograms/liter (µg/l), unless noted otherwise.
- All flow values are expressed as Million Gallons per Day (MGD).
- Discharge volumes are highest monthly average or 2C maximum for Industries and design flows for Municipalities.
- Hardness expressed as mg/l CaCO<sub>3</sub>. Standards calculated using Hardness values in the range of 25-400 mg/l CaCO<sub>3</sub>.
- "Public Water Supply" protects for fish & water consumption. "Other Surface Waters" protects for fish consumption only.
- Carcinogen "Y" indicates carcinogenic parameter.
- Ammonia WQSs selected from separate tables, based on pH and temperature.
- Metals measured as Dissolved, unless specified otherwise.
- WLA = Waste Load Allocation (based on standards).
- WLA = Waste Load Allocation (based on standards).
- WLAs are based on mass balances (less background, if data exist).
- Acute - 1 hour avg. concentration not to be exceeded more than 1/3 years.
- Chronic - 4 day avg. concentration (30 day avg. for Ammonia) not to be exceeded more than 1/3 years.
- Mass balances employ 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens, Harmonic Mean for Carcinogens, and Annual Average for Dioxin. Actual flows employed are a function of the mixing analysis and may be less than the actual critical flows.
- Effluent Limitations are calculated elsewhere using the minimum WLA and EPA's statistical approach (Technical Support Document).

# Fact Sheet – VPDES Permit No. VA0065552 – Opequon Water Reclamation Facility

## WQS – WLA Spreadsheet: 8.4 MGD Output

Facility Name: Opequon Water Reclamation Facility  
 Permit No.: VA0065552  
 Receiving Stream: Opequon Creek  
 Date: 12/1/2005

### WATER QUALITY CRITERIA

8.400 MGD Discharge Flow - Mix per "Mixer"

Toxic Parameter and Form	Carcinogen?	Human Health			
		Aquatic Protection		Public Water	Other Surface
		Acute	Chronic	Supplies	Waters
Acrolein	N	None	None	3.2E+02	7.8E+02
Acrylonitrile	Y	None	None	5.9E-01	6.6E+00
Ammonia-N (Annual)	N	1.4E+01 mg/L	1.8E+00 mg/L	None	None
Ammonia-N (Wet season)	N	1.3E+01 mg/L	2.5E+00 mg/L	None	None
Antimony	N	None	None	1.4E+01	4.3E+03
Benzidine	Y	None	None	1.2E-03	5.4E-03
Bis(2-Chloroethyl) Ether	N	None	None	3.1E-01	1.4E+01
Bis(2-Chloroisopropyl) Ether	N	None	None	1.4E+03	1.7E+05
Bromoform	Y	None	None	4.4E+01	3.6E+03
Cadmium	N	1.5E+01	2.8E+00	5.0E+00	None
Chloride	N	8.6E+02 mg/L	2.3E+02 mg/L	2.5E+02 mg/L	None
Chlorine, Total Residual	N	1.9E-02 mg/L	1.1E-02 mg/L	None	None
2-Chloronaphthalene	N	None	None	1.7E+03	4.3E+03
Copper	N	4.0E+01	2.4E+01	1.3E+03	None
3,3-Dichlorobenzidine	Y	None	None	4.0E-01	7.7E-01
1,2-trans-dichloroethylene	N	None	None	7.0E+01	1.4E+05
1,2-Dichloropropane	Y	None	None	5.2E+00	3.9E+02
1,3-Dichloropropane	N	None	None	1.0E+01	1.7E+03
Dimethyl Phthalate	N	None	None	3.1E+05	2.9E+06
2,4-Dinitrophenol	N	None	None	7.0E+01	1.4E+04
2-Methyl-4,6-Dinitrophenol	N	None	None	1.3E+01	7.7E+02
1,2-Diphenylhydrazine	Y	None	None	4.0E-01	5.4E+00
Endrin Aldehyde	N	None	None	7.6E-01	8.1E-01
Heptachlor Epoxide	Y	5.2E-01	3.8E-03	1.0E-03	1.1E-03
Hexachlorobenzene	Y	None	None	7.5E-03	7.7E-03
Hexachlorobutadiene	Y	None	None	4.4E+00	5.0E+02
Hexachlorocyclohexane Alpha-BHC	Y	None	None	3.9E-02	1.3E-01
Hexachlorocyclohexane Beta-BHC	Y	None	None	1.4E-01	4.6E-01
Hexachlorocyclopentadiene	N	None	None	2.4E+02	1.7E+04
Hexachloroethane	Y	None	None	1.9E+01	8.9E+01
Hydrogen Sulfide	N	None	2.0E+00	None	None
Kepon	N	None	Zero	None	None
Mercury	N	1.4E+00	7.7E-01	5.0E-02	5.1E-02
Methyl Bromide	N	None	None	4.8E+01	4.0E+03
Nickel	N	4.9E+02	5.4E+01	6.1E+02	4.6E+03
N-Nitrosodimethylamine	Y	None	None	6.9E-03	8.1E+01
N-Nitrosodiphenylamine	Y	None	None	5.0E+01	1.6E+02
N-Nitrosodi-n-propylamine	Y	None	None	5.0E-02	1.4E+01
RadNuc - Beta Part & Photon Act	N	None	None	4.0E+00 mrem	4.0E+00 mre
RadNuc - Gross Alpha Part Act	N	None	None	1.5E+01 pCi/L	1.5E+01 pCi
RadNuc - Strontium-90	N	None	None	8.0E+00 pCi/L	8.0E+00 pCi
RadNuc - Tritium	N	None	None	2.0E+04 pCi/L	2.0E+04 pCi
Selenium	N	2.0E+01	5.0E+00	1.7E+02	1.1E+04
1,1,2,2-Tetrachloroethane	Y	None	None	1.7E+00	1.1E+02
Thallium	N	None	None	1.7E+00	6.3E+00
1,1,2-Trichloroethane	Y	None	None	6.0E+00	4.2E+02

### NON-ANTIDEGRADATION WASTE LOAD ALLOCATIONS

8.400 MGD Discharge - Mix per "Mixer"

Toxic Parameter and Form	Carcinogen?	Aquatic Protection		Human Health
		Acute	Chronic	Health
		Acute	Chronic	Health
Acrolein	N	N/A	N/A	9.7E+02
Acrylonitrile	Y	N/A	N/A	1.2E+01
Ammonia-N (Annual)	N	1.5E+01 mg/L	2.1E+00 mg/L	N/A
Ammonia-N (Wet season)	N	1.6E+01 mg/L	3.8E+00 mg/L	N/A
Antimony	N	N/A	N/A	5.3E+03
Benzidine	Y	N/A	N/A	9.6E-03
Bis(2-Chloroethyl) Ether	N	N/A	N/A	1.7E+01
Bis(2-Chloroisopropyl) Ether	N	N/A	N/A	2.1E+05
Bromoform	Y	N/A	N/A	6.4E+03
Cadmium	N	1.6E+01	3.1E+00	N/A
Chloride	N	9.3E+02 mg/L	2.6E+02 mg/L	N/A
Chlorine, Total Residual	N	2.0E-02 mg/L	1.2E-02 mg/L	N/A
2-Chloronaphthalene	N	N/A	N/A	5.3E+03
Copper	N	4.3E+01	2.7E+01	N/A
3,3-Dichlorobenzidine	Y	N/A	N/A	1.4E+00
1,2-trans-dichloroethylene	N	N/A	N/A	1.7E+05
1,2-Dichloropropane	Y	N/A	N/A	7.0E+02
1,3-Dichloropropane	N	N/A	N/A	2.1E+03
Dimethyl Phthalate	N	N/A	N/A	3.6E+06
2,4-Dinitrophenol	N	N/A	N/A	1.7E+04
2-Methyl-4,6-Dinitrophenol	N	N/A	N/A	9.5E+02
1,2-Diphenylhydrazine	Y	N/A	N/A	9.6E+00
Endrin Aldehyde	N	N/A	N/A	1.0E+00
Heptachlor Epoxide	Y	5.6E-01	4.2E-03	2.0E-03
Hexachlorobenzene	Y	N/A	N/A	1.4E-02
Hexachlorobutadiene	Y	N/A	N/A	8.9E+02
Hexachlorocyclohexane Alpha-BHC	Y	N/A	N/A	2.3E-01
Hexachlorocyclohexane Beta-BHC	Y	N/A	N/A	8.2E-01
Hexachlorocyclopentadiene	N	N/A	N/A	2.1E+04
Hexachloroethane	Y	N/A	N/A	1.6E+02
Hydrogen Sulfide	N	N/A	2.2E+00	N/A
Kepon	N	N/A	Zero	N/A
Mercury	N	1.5E+00	8.6E-01	6.3E-02
Methyl Bromide	N	N/A	N/A	5.0E+03
Nickel	N	5.2E+02	6.0E+01	5.7E+03
N-Nitrosodimethylamine	Y	N/A	N/A	1.4E+02
N-Nitrosodiphenylamine	Y	N/A	N/A	2.9E+02
N-Nitrosodi-n-propylamine	Y	N/A	N/A	2.5E+01
RadNuc - Beta Part & Photon Act	N	N/A	N/A	5.0E+00 mrem
RadNuc - Gross Alpha Part Act	N	N/A	N/A	1.9E+01 pCi/L
RadNuc - Strontium-90	N	N/A	N/A	9.9E+00 pCi/L
RadNuc - Tritium	N	N/A	N/A	2.5E+04 pCi/L
Selenium	N	2.2E+01	5.6E+00	1.4E+04
1,1,2,2-Tetrachloroethane	Y	N/A	N/A	2.0E+02
Thallium	N	N/A	N/A	7.8E+00
1,1,2-Trichloroethane	Y	N/A	N/A	7.5E+02

# Fact Sheet – VPDE Permit No. VA0065552 – Opequon Water Reclamation Facility

## WQS – WLA Spreadsheet: 16.0 MGD (Dec-May) Input

### WATER QUALITY CRITERIA / WASTE LOAD ALLOCATION ANALYSIS

#### Facility Name:

Opequon Water Reclamation Facility

#### Receiving Stream:

Opequon Creek

Permit No.: VA0065552

Date: 11/28/2005

Version: OWP Guidance Memo 00-2011 (8/24/00)

#### Stream Information

Mean Hardness (as CaCO<sub>3</sub>) = 234 mg/L  
 90% Temperature (Annual) = 15.7 deg C  
 90% Temperature (Wet season) = deg C  
 90% Maximum pH = 8.5 SU  
 10% Maximum pH = 7.8 SU  
 Tier Designation = 1  
 Public Water Supply (PWS) Y/N? = N  
 V(alley) or P(iedmont)? = V  
 Trout Present Y/N? = N  
 Early Life Stages Present Y/N? = Y

#### Stream Flows

1Q10 (Annual) = 2 MGD  
 7Q10 (Annual) = 2.65 MGD  
 30Q10 (Annual) = 4.33 MGD  
 1Q10 (Wet season) = MGD  
 30Q10 (Wet season) = MGD  
 30Q5 = 2 MGD  
 Harmonic Mean = 6.59 MGD  
 Annual Average = 27.7 MGD

#### Mixing Information

Annual - 1Q10 Flow = 84.65 %  
 - 7Q10 Flow = 100 %  
 - 30Q10 Flow = 100 %  
 Wet Season - 1Q10 Flow = %  
 - 30Q10 Flow = %

#### Effluent Information

Mean Hardness (as CaCO<sub>3</sub>) = 326 mg/L  
 90% Temp (Annual) = 18.4 deg C  
 90% Temp (Wet season) = deg C  
 90% Maximum pH = 7.7 SU  
 10% Maximum pH = 7.4 SU  
 Current Discharge Flow = 16.000 MGD  
 Discharge Flow for Limit Analysis = 16.000 MGD

#### Footnotes:

- All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise.
- All flow values are expressed as Million Gallons per Day (MGD).
- Discharge volumes are highest monthly average or 2C maximum for Industries and design flows for Municipals.
- Hardness expressed as mg/l CaCO<sub>3</sub>. Standards calculated using Hardness values in the range of 25-400 mg/l CaCO<sub>3</sub>.
- "Public Water Supply" protects for fish & water consumption. "Other Surface Waters" protects for fish consumption only.
- Carcinogen "Y" indicates carcinogenic parameter.
- Ammonia WQSs selected from separate tables, based on pH and temperature.
- Metals measured as Dissolved, unless specified otherwise.
- WLA = Waste Load Allocation (based on standards).
- WLA = Waste Load Allocation (based on standards).
- WLAs are based on mass balances (less background, if data exist).
- Acute - 1 hour avg. concentration not to be exceeded more than 1/3 years.
- Chronic - 4 day avg. concentration (30 day avg. for Ammonia) not to be exceeded more than 1/3 years.
- Mass balances employ 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens, Harmonic Mean for Carcinogens, and Annual Average for Dioxin. Actual flows employed are a function of the mixing analysis and may be less than the actual critical flows.
- Effluent Limitations are calculated elsewhere using the minimum WLA and EPA's statistical approach (Technical Support Document).

# Fact Sheet – VPDE Permit No. VA0065552 – Opequon Water Reclamation Facility

## WQS – WLA Spreadsheet: 16.0 MGD (Dec-May) Output

Facility Name: Opequon Water Reclamation Facility  
 Permit No.: VA0065552  
 Receiving Stream: Opequon Creek  
 Date: 11/28/2005

### WATER QUALITY CRITERIA

16,000 MGD Discharge Flow - Mix per "Mixer"

Toxic Parameter and Form	Carcinogen?	Human Health			
		Aquatic Protection		Public Water	Other Surface
		Acute	Chronic	Supplies	Waters
Acrolein	N	None	None	3.2E+02	7.8E+02
Acrylonitrile	Y	None	None	5.9E-01	6.6E+00
Ammonia-N (Annual)	N	1.4E+01 mg/L	2.6E+00 mg/L	None	None
Antimony	N	None	None	1.4E+01	4.3E+03
Benzidine	Y	None	None	1.2E-03	5.4E-03
Bis2-Chloroethyl Ether	N	None	None	3.1E-01	1.4E+01
Bis2-Chloroisopropyl Ether	N	None	None	1.4E+03	1.7E+05
Bromoform	Y	None	None	4.4E+01	3.6E+03
Cadmium	N	1.4E+01	2.8E+00	5.0E+00	None
Chloride	N	8.6E+02 mg/L	2.3E+02 mg/L	2.5E+02 mg/L	None
Chlorine, Total Residual	N	1.9E-02 mg/L	1.1E-02 mg/L	None	None
2-Chloronaphthalene	N	None	None	1.7E+03	4.3E+03
Copper	N	4.0E+01	2.4E+01	1.3E+03	None
3,3-Dichlorobenzidine	Y	None	None	4.0E-01	7.7E-01
1,2-trans-dichloroethylene	N	None	None	7.0E+01	1.4E+05
1,2-Dichloropropane	Y	None	None	5.2E+00	3.9E+02
1,3-Dichloropropene	N	None	None	1.0E+01	1.7E+03
Dimethyl Phthalate	N	None	None	3.1E+05	2.9E+06
2,4 Dinitrophenol	N	None	None	7.0E+01	1.4E+04
2-Methyl-4,6-Dinitrophenol	N	None	None	1.3E+01	7.7E+02
1,2-Diphenylhydrazine	Y	None	None	4.0E-01	5.4E+00
Endrin Aldehyde	N	None	None	7.6E-01	8.1E-01
Heptachlor Epoxide	Y	5.2E-01	3.8E-03	1.0E-03	1.1E-03
Hexachlorobenzene	Y	None	None	7.5E-03	7.7E-03
Hexachlorobutadiene	Y	None	None	4.4E+00	5.0E+02
Hexachlorocyclohexane Alpha-BH	Y	None	None	3.9E-02	1.3E-01
Hexachlorocyclohexane Beta-BHC	Y	None	None	1.4E-01	4.6E-01
Hexachlorocyclopentadiene	N	None	None	2.4E+02	1.7E+04
Hexachloroethane	Y	None	None	1.9E+01	8.9E+01
Hydrogen Sulfide	N	None	2.0E+00	None	None
Kepone	N	None	Zero	None	None
Mercury	N	1.4E+00	7.7E-01	5.0E-02	5.1E-02
Methyl Bromide	N	None	None	4.8E+01	4.0E+03
Nickel	N	4.8E+02	5.3E+01	6.1E+02	4.6E+03
N-Nitrosodimethylamine	Y	None	None	6.9E-03	8.1E+01
N-Nitrosodiphenylamine	Y	None	None	5.0E+01	1.6E+02
N-Nitrosodi-n-propylamine	Y	None	None	5.0E-02	1.4E+01
RadNuc - Beta Part & Photon Act	N	None	None	4.0E+00 mrem	4.0E+00 mre
RadNuc - Gross Alpha Part Act	N	None	None	1.5E+01 pCi/L	1.5E+01 pCi
RadNuc - Strontium-90	N	None	None	8.0E+00 pCi/L	8.0E+00 pCi
RadNuc - Tritium	N	None	None	2.0E+04 pCi/L	2.0E+04 pCi
Selenium	N	2.0E+01	5.0E+00	1.7E+02	1.1E+04
1,1,2,2-Tetrachloroethane	Y	None	None	1.7E+00	1.1E+02
Thallium	N	None	None	1.7E+00	6.3E+00
1,1,2-Trichloroethane	Y	None	None	6.0E+00	4.2E+02

### NON-ANTIDegradation WASTE LOAD ALLOCATIONS

16,000 MGD Discharge - Mix per "Mixer"

Aquatic Protection		Human Health
Acute	Chronic	Health
N/A	N/A	8.8E+02
N/A	N/A	9.3E+00
1.5E+01 mg/L	3.3E+00 mg/L	N/A
N/A	N/A	4.8E+03
N/A	N/A	7.6E-03
N/A	N/A	1.6E+01
N/A	N/A	1.9E+05
N/A	N/A	5.1E+03
1.6E+01	3.2E+00	N/A
9.5E+02 mg/L	2.7E+02 mg/L	N/A
2.1E-02 mg/L	1.3E-02 mg/L	N/A
N/A	N/A	4.8E+03
4.4E+01	2.8E+01	N/A
N/A	N/A	1.1E+00
N/A	N/A	1.6E+05
N/A	N/A	5.5E+02
N/A	N/A	1.9E+03
N/A	N/A	3.3E+06
N/A	N/A	1.6E+04
N/A	N/A	8.6E+02
N/A	N/A	7.6E+00
N/A	N/A	9.1E-01
5.8E-01	4.4E-03	1.6E-03
N/A	N/A	1.1E-02
N/A	N/A	7.1E+02
N/A	N/A	1.8E-01
N/A	N/A	6.5E-01
N/A	N/A	1.9E+04
N/A	N/A	1.3E+02
N/A	2.3E+00	N/A
N/A	Zero	N/A
1.5E+00	9.0E-01	5.7E-02
N/A	N/A	4.5E+03
5.4E+02	6.2E+01	5.2E+03
N/A	N/A	1.1E+02
N/A	N/A	2.3E+02
N/A	N/A	2.0E+01
N/A	N/A	4.5E+00
N/A	N/A	1.7E+01
N/A	N/A	9.0E+00
N/A	N/A	2.3E+04
2.2E+01	5.8E+00	1.2E+04
N/A	N/A	1.6E+02
N/A	N/A	7.1E+00
N/A	N/A	5.9E+02

**Fact Sheet – VPDE Permit No. VA0065552 – Opequon Water Reclamation Facility**

**STAT.EXE Results – Flow Tier 1 (Interim and Final)**

**Ammonia-N – 8.4 MGD (annual)**

Chronic averaging period = 30

WLAa = 15

WLAc = 2.1

Q.L. = 0.2

# samples/mo. = 30

# samples/wk. = 7

Summary of Statistics:

# observations = 1

Expected Value = 9

Variance = 29.16

C.V. = 0.6

97th percentile daily values = 21.9007

97th percentile 4 day average = 14.9741

97th percentile 30 day average = 10.8544

# < Q.L. = 0

Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity

Maximum Daily Limit = 4.23710719617425

Average Weekly limit = 2.5876319004845

Average Monthly Limit = 2.1

The data are: 9

**Ammonia-N – 16.0 MGD (wet season)**

Chronic averaging period = 30

WLAa = 15

WLAc = 3.3

Q.L. = 0.2

# samples/mo. = 30

# samples/wk. = 7

Summary of Statistics:

# observations = 1

Expected Value = 9

Variance = 29.16

C.V. = 0.6

97th percentile daily values = 21.9007

97th percentile 4 day average = 14.9741

97th percentile 30 day average = 10.8544

# < Q.L. = 0

Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity

Maximum Daily Limit = 6.65831130827382

Average Weekly limit = 4.06627870076135

Average Monthly Limit = 3.3

The data are: 9

**Ammonia-N – 8.4 MGD (wet season)**

Chronic averaging period = 30

WLAa = 16

WLAc = 3.8

Q.L. = 0.2

# samples/mo. = 30

# samples/wk. = 7

Summary of Statistics:

# observations = 1

Expected Value = 9

Variance = 29.16

C.V. = 0.6

97th percentile daily values = 21.9007

97th percentile 4 day average = 14.9741

97th percentile 30 day average = 10.8544

# < Q.L. = 0

Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity

Maximum Daily Limit = 7.66714635498198

Average Weekly limit = 4.68238153421004

Average Monthly Limit = 3.8

The data are: 9

**Total Residual Chlorine – 8.4 MGD**

Chronic averaging period = 4

WLAa = 0.02

WLAc = 0.012

Q.L. = 0.1

# samples/mo. = 30

# samples/wk. = 7

Summary of Statistics:

# observations = 1

Expected Value = 20

Variance = 144

C.V. = 0.6

97th percentile daily values = 48.6683

97th percentile 4 day average = 33.2758

97th percentile 30 day average = 24.1210

# < Q.L. = 0

Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity

Maximum Daily Limit = 1.75508974086388E-02

Average Weekly limit = 1.07184595324212E-02

Average Monthly Limit = 8.69859620059178E-03

The data are: 20

**Chloride – 8.4 MGD**

Chemical = Chloride  
 Chronic averaging period = 4  
 WLAa = 930  
 WLAc = 260  
 Q.L. = 1  
 # samples/mo. = 1  
 # samples/wk. = 1

Summary of Statistics:

# observations = 67  
 Expected Value = 151.660  
 Variance = 1078.69  
 C.V. = 0.216558  
 97th percentile daily values = 221.720  
 97th percentile 4 day average = 184.730  
 97th percentile 30 day average = 162.939  
 # < Q.L. = 0  
 Model used = lognormal

No Limit is required for this material

The data are:

200	150	230	140	170	180	150
195	100	150	190	160	155	140
190	180	150	190	220	155	80
100	130	110	150	120	160	140
150	90	120	140	160	170	140
90	190	140	150	160	130	110
170	190	133	130	150	145	110
120	130	110	170	150	200	
160	140	170	140	170	140	
150	160	180	170	180	155	

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**Copper – 8.4 MGD**

Chronic averaging period = 4  
WLAa = 43  
WLAc = 27  
Q.L. = 0.5  
# samples/mo. = 1  
# samples/wk. = 1

**Summary of Statistics:**

# observations = 3  
Expected Value = 6  
Variance = 12.96  
C.V. = 0.6  
97th percentile daily values = 14.6005  
97th percentile 4 day average = 9.98274  
97th percentile 30 day average = 7.23631  
# < Q.L. = 0  
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are: 5, 6, 7

**Cadmium – 8.4 MGD**

Chronic averaging period = 4  
WLAa = 16  
WLAc = 3.1  
Q.L. = 0.3  
# samples/mo. = 1  
# samples/wk. = 1

**Summary of Statistics:**

# observations = 3  
Expected Value = 5  
Variance = 9  
C.V. = 0.6  
97th percentile daily values = 12.1670  
97th percentile 4 day average = 8.31895  
97th percentile 30 day average = 6.03026  
# < Q.L. = 0  
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity  
Maximum Daily Limit = 4.53398183056502  
Average Weekly limit = 4.53398183056502  
Average Monthly Limit = 4.53398183056502

The data are: 5, 5, 5

**Selenium – 8.4 MGD**

Chronic averaging period = 4  
WLAa = 22  
WLAc = 5.6  
Q.L. = 2.0  
# samples/mo. = 1  
# samples/wk. = 1

**Summary of Statistics:**

# observations = 3  
Expected Value = 10  
Variance = 36  
C.V. = 0.6  
97th percentile daily values = 24.3341  
97th percentile 4 day average = 16.6379  
97th percentile 30 day average = 12.0605  
# < Q.L. = 0  
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity  
Maximum Daily Limit = 8.1904187906981  
Average Weekly limit = 8.1904187906981  
Average Monthly Limit = 8.1904187906981

The data are: 10, 10, 10

**Nickel – 8.4 MGD**

Chronic averaging period = 4  
WLAa = 520  
WLAc = 60  
Q.L. = 0.5  
# samples/mo. = 1  
# samples/wk. = 1

**Summary of Statistics:**

# observations = 1  
Expected Value = 5  
Variance = 9  
C.V. = 0.6  
97th percentile daily values = 12.1670  
97th percentile 4 day average = 8.31895  
97th percentile 30 day average = 6.03026  
# < Q.L. = 0  
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are: 5



STAT.EXE Results – Flow Tier 2

Ammonia-N – 10.4 MGD (annual)

Chronic averaging period = 30

WLAa = 15

WLAc = 2.1

Q.L. = 0.2

# samples/mo. = 30

# samples/wk. = 7

Summary of Statistics:

# observations = 1

Expected Value = 9

Variance = 29.16

C.V. = 0.6

97th percentile daily values = 21.9007

97th percentile 4 day average = 14.9741

97th percentile 30 day average = 10.8544

# < Q.L. = 0

Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity

Maximum Daily Limit = 4.23710719617425

Average Weekly limit = 2.5876319004845

Average Monthly Limit = 2.1

The data are: 9

Ammonia-N – 10.4 MGD (wet season)

Chronic averaging period = 30

WLAa = 15

WLAc = 3.6

Q.L. = 0.2

# samples/mo. = 30

# samples/wk. = 7

Summary of Statistics:

# observations = 1

Expected Value = 9

Variance = 29.16

C.V. = 0.6

97th percentile daily values = 21.9007

97th percentile 4 day average = 14.9741

97th percentile 30 day average = 10.8544

# < Q.L. = 0

Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity

Maximum Daily Limit = 7.26361233629872

Average Weekly limit = 4.43594040083056

Average Monthly Limit = 3.6

The data are: 9

Total Residual Chlorine – 10.4 MGD

Chronic averaging period = 4

WLAa = 0.02

WLAc = 0.012

Q.L. = 0.1

# samples/mo. = 30

# samples/wk. = 7

Summary of Statistics:

# observations = 1

Expected Value = 20

Variance = 144

C.V. = 0.6

97th percentile daily values = 48.6683

97th percentile 4 day average = 33.2758

97th percentile 30 day average = 24.1210

# < Q.L. = 0

Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity

Maximum Daily Limit = 1.75508974086388E-02

Average Weekly limit = 1.07184595324212E-02

Average Monthly Limit = 8.69859620059178E-03

The data are: 20

# Fact Sheet – VPDE Permit No. VA0065552 – Opequon Water Reclamation Facility

## TOXLARGE – Flow Tier 3

Refer to the toxic pollutant table below for the evaluation results for ammonia-N and TRC. Additional monitoring data is needed for all other WQS parameters for the 12.2 MGD facility. The permit Attachment A2 includes a list of those parameters for which sample data is required.

Parameter	CASRN	Type	QL (µg/L)	12.6 MGD Data (µg/L unless noted otherwise)	Source of Data	Data Eval
Ammonia-N (mg/L) (Annual)	766-41-7	X	0.2 mg/L	Default = 9 mg/L	a	C.2
Ammonia-N (mg/L) (Wet Season)	766-41-7	X	0.2 mg/L	Default = 9 mg/L	a	C.2
TRC (mg/L)	7782-50-5	X	0.1 mg/L	Default = 20 mg/L	a	C.2

"Type" column indicates a category assigned to the referenced substance (see below):

X = Miscellaneous Compounds and Parameters

The superscript "C" following the parameter name indicates that the substance is a known or suspected carcinogen; human health criteria at risk level 10<sup>-5</sup>.

"Source of Data" codes:

a = Default effluent concentration

"Data Evaluation" codes:

See section titled "EVALUATION OF EFFLUENT TOXIC POLLUTANTS" (preceding the parameter table) for an explanation of the code used.

CASRN = Chemical Abstract Service Registry Number for each parameter is referenced in the current Water Quality Standards. A unique numeric identifier designating only one substance. The Chemical Abstract Service is a division of the American Chemical Society.

## WQS-WLA Spreadsheet: Flow Tier 3 Input

### WATER QUALITY CRITERIA / WASTE LOAD ALLOCATION ANALYSIS

Facility Name:  
Opequon Water Reclamation Facility  
Receiving Stream:  
Opequon Creek

Permit No.: VA0065552  
Date: 12/1/2005

Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information	Stream Flows	Mixing Information	Effluent Information
Mean Hardness (as CaCO <sub>3</sub> ) = 234 mg/L	1Q10 (Annual) = 0.71 MGD	Annual - 1Q10 Flow = 87.53 %	Mean Hardness (as CaCO <sub>3</sub> ) = 326 mg/L
90% Temperature (Annual) = 21.9 deg C	7Q10 (Annual) = 0.97 MGD	- 7Q10 Flow = 100 %	90% Temp (Annual) = 24.5 deg C
90% Temperature (Wet season) = 15.7 deg C	30Q10 (Annual) = 1.42 MGD	- 30Q10 Flow = 100 %	90% Temp (Wet season) = 18.4 deg C
90% Maximum pH = 8.5 SU	1Q10 (Wet season) = 2 MGD	Wet Season - 1Q10 Flow = 83.83 %	90% Maximum pH = 7.7 SU
10% Maximum pH = 7.8 SU	30Q10 (Wet season) = 4.33 MGD	- 30Q10 Flow = 100 %	10% Maximum pH = 7.4 SU
Tier Designation = 1	30Q5 = 2 MGD		Current Discharge Flow = 8.400 MGD
Public Water Supply (PWS) Y/N? = N	Harmonic Mean = 6.59 MGD		Discharge Flow for Limit Analysis = 12.600 MGD
V(alley) or P(edmont)? = V	Annual Average = 27.7 MGD		
Trout Present Y/N? = N			
Early Life Stages Present Y/N? = Y			

#### Footnotes:

- All concentrations expressed as micrograms/liter (µg/L), unless noted otherwise.
- All flow values are expressed as Million Gallons per Day (MGD).
- Discharge volumes are highest monthly average or 2C maximum for Industries and design flows for Municipalities.
- Hardness expressed as mg/L CaCO<sub>3</sub>. Standards calculated using Hardness values in the range of 25-400 mg/L CaCO<sub>3</sub>.
- "Public Water Supply" protects for fish & water consumption. "Other Surface Waters" protects for fish consumption only.
- Carcinogen "Y" indicates carcinogenic parameter.
- Ammonia WQSs selected from separate tables, based on pH and temperature.
- Metals measured as Dissolved, unless specified otherwise.
- WLA = Waste Load Allocation (based on standards).
- WLA = Waste Load Allocation (based on standards).
- WLAs are based on mass balances (less background, if data exist).
- Acute - 1 hour avg. concentration not to be exceeded more than 1/3 years.
- Chronic - 4 day avg. concentration (30 day avg. for Ammonia) not to be exceeded more than 1/3 years.
- Mass balances employ 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens, Harmonic Mean for Carcinogens, and Annual Average for Dioxin. Actual flows employed are a function of the mixing analysis and may be less than the actual critical flows.
- Effluent Limitations are calculated elsewhere using the minimum WLA and EPA's statistical approach (Technical Support Document).

## WQS-WLA Spreadsheet: Flow Tier 3 Input

Facility Name:  
Opequon Water Reclamation Facility  
Receiving Stream:  
Opequon Creek

Permit No.:  
VA0065552  
Date:  
11/29/2005

### POST - EXPANSION WATER QUALITY CRITERIA 12.600 MGD Discharge Flow - Mix per "Mixer"

Toxic Parameter and Form	Carcinogen?	Aquatic Protection		Human Health	
		Acute	Chronic	Public Water Supplies	Other Surface Waters
Ammonia-N (Annual)	N	1.4E+01 mg/L	1.8E+00 mg/L	None	None
Ammonia-N (Wet season)	N	1.3E+01 mg/L	2.6E+00 mg/L	None	None
Chlorine, Total Residual	N	1.9E-02 mg/L	1.1E-02 mg/L	None	None

### NON-ANTIDEGRADATION WASTE LOAD ALLOCATIONS 12.600 MGD Discharge - Mix per "Mixer"

Aquatic Protection		Human Health
Acute	Chronic	
1.5E+01 mg/L	2.0E+00 mg/L	N/A
1.5E+01 mg/L	3.5E+00 mg/L	N/A
2.0E-02 mg/L	1.2E-02 mg/L	N/A

**Fact Sheet – VPDES Permit No. VA0065552 – Opequon Water Reclamation Facility**

**STAT.EXE Results – Flow Tiers 3**

**Ammonia-N – 12.6 MGD (annual)**

Chronic averaging period = 30  
WLAa = 15  
WLAc = 2  
Q.L. = 0.2  
# samples/mo. = 30  
# samples/wk. = 7

**Summary of Statistics:**

# observations = 1  
Expected Value = 9  
Variance = 29.16  
C.V. = 0.6  
97th percentile daily values = 21.9007  
97th percentile 4 day average = 14.9741  
97th percentile 30 day average = 10.8544  
# < Q.L. = 0  
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity  
Maximum Daily Limit = 4.03534018683262  
Average Weekly limit = 2.46441133379476  
Average Monthly Limit = 2

The data are: 9

**Ammonia-N – 12.6 MGD (wet season)**

Chronic averaging period = 30  
WLAa = 15  
WLAc = 3.5  
Q.L. = 0.2  
# samples/mo. = 30  
# samples/wk. = 7

**Summary of Statistics:**

# observations = 1  
Expected Value = 9  
Variance = 29.16  
C.V. = 0.6  
97th percentile daily values = 21.9007  
97th percentile 4 day average = 14.9741  
97th percentile 30 day average = 10.8544  
# < Q.L. = 0  
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity  
Maximum Daily Limit = 7.06184532695709  
Average Weekly limit = 4.31271983414083  
Average Monthly Limit = 3.5

The data are: 9

**Total Residual Chlorine – 12.6 MGD**

Chronic averaging period = 4  
WLAa = 0.02  
WLAc = 0.012  
Q.L. = 0.1  
# samples/mo. = 30  
# samples/wk. = 7

**Summary of Statistics:**

# observations = 1  
Expected Value = 20  
Variance = 144  
C.V. = 0.6  
97th percentile daily values = 48.6683  
97th percentile 4 day average = 33.2758  
97th percentile 30 day average = 24.1210  
# < Q.L. = 0  
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity  
Maximum Daily Limit = 1.75508974086388E-02  
Average Weekly limit = 1.07184595324212E-02  
Average Monthly Limit = 8.69859620059178E-03

The data are: 20

## Fact Sheet – VPDES Permit No. VA0065552 – Opequon Water Reclamation Facility

The following results were determined:

- a. **Ammonia-N:** Per the STAT.EXE evaluation results, annual ammonia-N monthly average and maximum weekly average limits were applied to all flow tiers. Corresponding wet season limits were also applied since they were determined to be significantly greater than the annual limits. The change in the Interim Flow Tier 1 limits from the previous permit is the result of new stream data at this reissuance. Current guidance recommends that the frequency of monitoring be set the same as the frequency for (C)BOD since both parameters are operational factors relating to nitrification. The recommended baseline monitoring frequency for this facility is 1/Day.
- b. **Total Residual Chlorine:** Per the STAT.EXE evaluation results, TRC monthly average and maximum weekly average limits were applied to all flow tiers. The limits are nearly identical to those required by the previous permit. The change in the limits is the result of new stream data at this reissuance. The chlorine contact tank TRC limit of 0.25 mg/L was demonstrated to be sufficient for disinfection during the 1991 permit reissuance. This limit was carried forward during the 1996 and 2001 permit reissuance and, because there is no data to indicate inadequate disinfection, this limit was again carried forward at this reissuance. The permit also contains bacteria limitations to ensure effective disinfection is continually achieved.
- c. **Chloride:** Based on monitoring data submitted by the permittee during the last permit cycle, a chloride limit was determined not to be necessary. This determination is the result of new monitoring and stream data. No chloride limit would have been applied to the permit had this data been available during the previous chloride limit evaluation.
- d. **Selenium & Cadmium:** New data provided by the permittee as part of the EPA Form 2A application was insufficient to determine if a limit is needed for these parameters. As such, additional monitoring for these constituents will be imposed in Attachment A1 of the permit.

There are no other pollutants of concern known to exist in this discharge.

### REDUCED MONITORING FREQUENCY EVALUATION

The applicant requested reduced monitoring frequencies for CBOD, BOD, TSS, pH and DO be considered at this reissuance. Per the VPDES Permit Manual, to qualify for consideration of reduced monitoring requirements, the facility should not have been issued any Warning Letters, NOV's, or NULEs, or be under any Consent Orders, Consent Decrees, Executive Compliance Agreements, or related enforcement documents during the past three years. This evaluation applies only to the existing 8.4 MGD (Jun-Nov), 16.0 MGD (Dec-May) flow tier.

The facility received a Warning Letter for a BOD<sub>5</sub> (Jun-Nov) violation as well as an NOV for several NH<sub>3</sub>-N (Dec-May) violations within the last three years from the date of this evaluation (11/14/05). As such neither of these parameters may be monitored at a reduced frequency.

The minimum DO concentration was violated during June 2004, but no compliance statement was issued by DEQ. Per the VPDES Permit Manual, where the post aeration system is passive (i.e. cascade steps), reduction of the monitoring frequency is to be considered on a case-by-case basis. The minimum monthly DO was reported to be within 0.5 mg/L (or less) of the limit on nine occasions from April 2004 to September 2005. Based on this evidence it does appear prudent to allow a reduction in the DO monitoring frequency.

The minimum pH for February 2005 was reported as 6.92 S.U., which is less than 0.5 S.U.'s above the minimum pH limit of 6.5 S.U. Per the VPDES Permit Manual, reduced monitoring should not be allowed where minimum or maximum pHs fall within 0.5 S.U.'s of the permit limits.

**Fact Sheet – VPDES Permit No. VA0065552 – Opequon Wastewater Reclamation Facility**

The long term average effluent CBOD<sub>5</sub> (Dec-May) values (monthly and maximum weekly average concentrations and quantities) are all less than 25% of the CBOD<sub>5</sub> (Dec-May) limit. As such the monitoring frequency was adjusted from 1/Day to 1/Week for this parameter at this reissuance.

The long term average effluent NH<sub>3</sub>-N (Jun-Nov) values (monthly and maximum weekly average concentrations and quantities) are all less than 25% of the NH<sub>3</sub>-N (Jun-Nov) limit. As such the monitoring frequency will be set at 1/Week. The previous permit required NH<sub>3</sub>-N monitoring 1/Month. Current agency guidance recommends NH<sub>3</sub>-N be monitored at the same frequency as BOD. The monitoring frequency for BOD (Jun-Nov) is 1/Day.

Per the VPDES Permit Manual, upgraded facilities should generate three years of data before being eligible for consideration for reduced monitoring. As such, reduced monitoring frequencies were not applied to the nutrient compliant and expanded facilities, except for CBOD. Because the nutrient compliant and expanded facilities will be required to meet reduced and limit of technology annual TN and TP limits, respectively, monitoring for CBOD was reduced below the recommended frequency for a conventional wastewater treatment plant. A CBOD limit of 25 mg/L is not considered to be a permit limiting parameter for an ENR facility, and as such the monitoring frequency was set at 1/Week. This monitoring frequency should be sufficient to adequately gauge the treatment efficiency of the facility. The normal monitoring frequency of 1/Day may be reinstated should the facility fail to comply with the CBOD permit limitations.

**OPEQUON CREEK CAPACITY STUDY**

**Notes:**

Additional model runs included in the OCCS report attachments were submitted during the 2005 Parkins Mills WWTF (PMWWTF) VPDES permit (VA0075191) modification. These model runs include a range of effluent limits and flows for the PMWWTF as well as limits and flows for the Frederick County Landfill and OWRF discharges. Attachment 4 includes dry season model data for the expanded OWRF discharges of 10.4 and 12.6 MGD. Wet season CBOD and DO permit limits for the 10.4 and 12.6 MGD effluent flows are based on the 16.0 MGD discharge model runs included in Attachment 1.

Per the model developer (HydroQual):

1. All model report and data references to BOD are to be interpreted as CBOD. NBOD is evaluated based on Org-N and Ammonia-N.
2. The CBODu/BOD<sub>5</sub> ratio used for the original winter effluent BOD<sub>5</sub> levels (23 mg/L at PMWWTF and 25 mg/L at OWRF) was modified (from the model report) to reflect the variation in the ratio as a function of treatment level. The ratio increases with better treatment performance (lower BOD<sub>5</sub> levels) and decreases with lower treatment performance (higher BOD<sub>5</sub> levels). Therefore, for higher winter BOD<sub>5</sub> levels, a CBODu/BOD<sub>5</sub> ratio of 3 was used for the water quality projection. The summer ratio used was 5.14 for the PMWWTF and 4.77 for the OWRF.
3. DO values continue to increase to Turkey Run due to reducing CBOD and NH<sub>3</sub> levels (less DO consumption) and atmospheric reaeration. When the DO levels are at or above saturation, this is due to algal photosynthesis (oxygen production). When the algal oxygen production exceeds the amount of oxygen that is lost to the atmosphere, DO levels can become super-saturated.
4. CBOD and NBOD from the point-sources within the model will continue to decrease in the downstream direction back to background conditions (downstream from the end of the model) due to continued decay of CBOD and NH<sub>3</sub>. Other inputs of CBOD and NH<sub>3</sub> downstream will ultimately determine what CBOD and NH<sub>3</sub> levels will be maintained downstream.
5. Output for the model is provided roughly every 0.5 miles. For the Alleghany County DIURNAL model (lower Jackson/James River) that was provided to VDEQ, an output frequency of between 0.2-1 miles was used and for the Mead-Westvaco DIURNAL model (Jackson River) an output frequency of 0.1-0.5 miles was used. Since for each model reach the model characteristics are the same (e.g., geometry, incremental flow and WQ, constants, temperature), the calculated variation in each reach is continuous (i.e., there will be no sudden changes in model output between the outputted mile points). Therefore, additional model output at 0.1 increments would not add any additional information to the report and intermediate model output can be closely estimated by interpolating between the current model outputs.
6. Estimates of the distance downstream where DO impacts are noticeable from the 3 point-sources (Parkins Mills WWTF, Frederick County Landfill, OWRF) are as follows: Roughly, the DO impact from the PMWWTF extends about 6.5 miles below the outfall (until the FCL and OWRF discharges). The DO impact from the FCL extends about 5 miles below the outfall (until the OWRF discharge). The DO impact from the OWRF extends about 15 miles below the outfall (until the end of the model).